UNITED STATES PATENT OFFICE.

THOMAS PATON, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN MAKING MILLS AND SKELETON DIES FOR PRINTING.

Specification forming part of Letters Patent No. **5,871**, dated October 24, 1848.

To all whom it may concern:

Be it known that I, THOMAS PATON, of Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in the Mode or Process of Making Mills and Skeleton Dies for Forming the Figure or Figures on the External Surfaces of Calico-Printing Rollers; and I do hereby declare that the same is fully represented and described in the following specification.

The original process of making the skeleton die consisted in engraving on a small, soft, steel cylinder the grounds and bondage of the pattern, the figures being left to stand out within the bondage in bas-relief. The cylinder so made was afterward hardened and rolled under great pressure in contact with another cylinder of soft steel, of similar size, termed the "mill." The engraved or sunken parts of the die—that is to say, the ground and bondage—would thus produce counterpart elevations or bas-reliefs on the mill, while the figure parts in relief on the die would produce corresponding sinkings or depressions on the mill. The great expenditure of manual labor required to cut and form the ground and bondage suggested the propriety of making the ground on the mill by means of a milling-cylinder. This was accomplished by making the skeleton die without the ground and bondage, but only with the figure portions raised in bas-relief. To do this it was only necessary to first cover all those parts of the cylinder or die which were to represent the figures in bas-relief with a resisting vehicle or asphaltic preparation or varnish capable of preventing any strong acid from acting on the metallic parts so covered by it, and next plunge the cylinder in an acid solution capable of eating down or reducing the portions of surface exposed to its action. The die so prepared and properly hardened was next pressed and run in contact with a softened steel cylinder in such manner as to cause the parts in bas-relief on the die to sink corresponding parts of the surface of the mill and leave the parts for the grounds and bondage standing in bas-relief on the surface of the mill. The next process was to run the cylinder so prepared in contact with a milling-tool or milling-cylinder having the ground figure, whatever it might be, made upon its surface. The said milling-tool or small cylinder being pressed and made to roll in contact with the raised portions of the mill, produced thereupon corresponding impressions of its surface. This being done, the bondage around the edges of the said impressions had to be put on by hand—that is to say, by the engraver himself.

Although the improvement above described was and has always been considered a very great one in the manufacture of the skeleton die and the mill, yet it has been attended with some apparently insuperable disadvantages, which are completely overcome by my improved method or process of making the die and mill. The principal difficulty arising from the above-described improved mode of making the mill consisted in the breaking down or crushing of the edges of the raised parts of the mill and the occasional rolling of the milling cylinder or tool in contact with some of the sunken parts or surfaces. More or less distortion and injuries of the shape or outline of the ground were the natural consequences. Besides all this, the difficulty of making a proper bondage on the milled surface was very great and attended with much care, time, and labor.

My improvement is as follows:

The parts of the surface of the die which are to represent the ground and bondage I sink below the others. This I do in part by acids and in part by a bondage-tool used by hand. I first cover with the resisting medium the parts which are not to be exposed to the acid solution. This done, I expose the others to the action of the reducing acid and eat down their surfaces to the depth required for the bondage. I next stamp or engrave the bondage around the protected parts, and after protecting such bondage, as well as the parts before protected, by covering it and them with the resisting medium, I expose the others to the dissolving power of the acid solution and reduce them to the extent required. The die is thus completed, it only remaining to form upon it the snag-holes, which are punched into it in the usual manner.

In order to make the mill, I take a plain cylinder, and by means of the milling-tool or milling-cylinder having the small ground figure upon its periphery I mill the whole or entire curved surface of said plain cylinder. I next bring the curved surface of the said cylinder so prepared in contact with the die, prepared with the bondage and sunken ground, as above specified. I press and roll them together in

such manner as to cause the parts in relief on the die to sink into the milled surface of the mill, and by so doing efface the milling on the corresponding parts of the mill, and produce the bondage around the edges of the remaining parts, or those which make the ground figure on the copper printing-cylinder.

By my said improved process of making the die and mill I am enabled to make a much more perfect printing-cylinder than can be produced from any mill made in the ordinary manner, and in part by a milling tool or cylinder.

What I claim as my invention is—

My above-described improved process of making the mill, the same consisting, first, in making on the die and in incavo the bondage and a ground space without the ground figures; next in milling the entire curved surface of the mill by a separate milling cylinder or tool, as described; next pressing and rolling the die and mill together, so as to sink or produce on the latter an impression of the bondage and figure portions and leave the entire ground of the mill in relief, as specified.

In testimony whereof I have hereto set my signature this 10th day of November, A. D. 1847.

THOMAS PATON. [L. S.]

Witnesses:

WM. KNOWLES,

JAS. PATON.