No. 661,142. Patented Nov. 6, 1900.

C. GRASSER.

PRINTING SURFACE AND PROCESS OF PRODUCING SAME.

(Application filed May 12, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1,

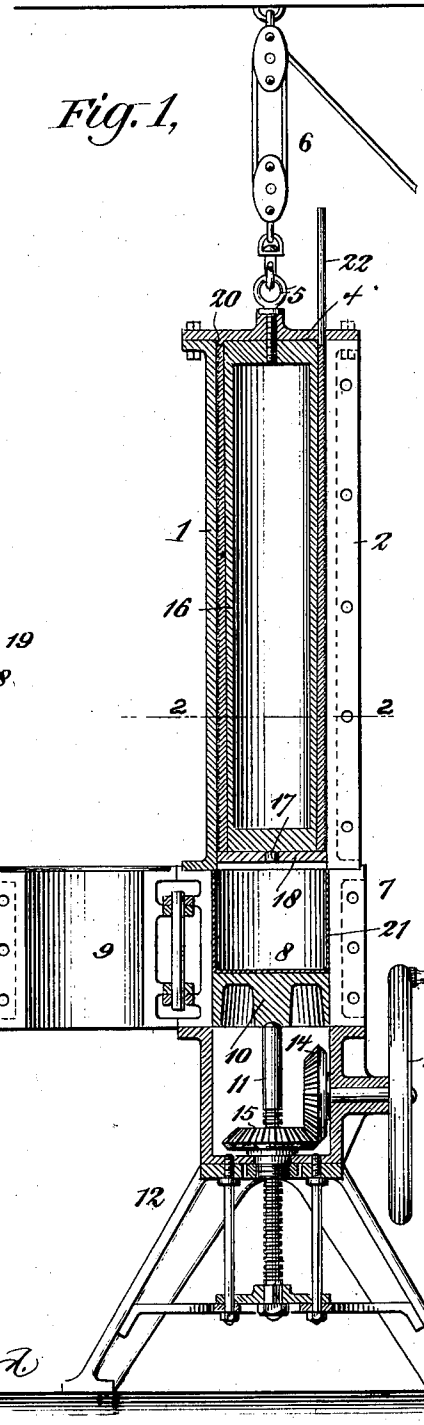



Fig. 3,

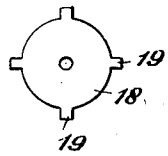
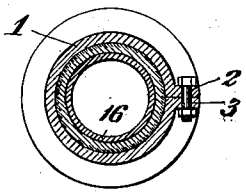



Fig. 2,




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No. 661,142. Patented Nov. 6, 1900.

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PRINTING SURFACE AND PROCESS OF PRODUCING SAME.

(Application filed May 12, 1899.)

(No Model.) 2 Sheets—Sheet 2.

*Fig. 4,*

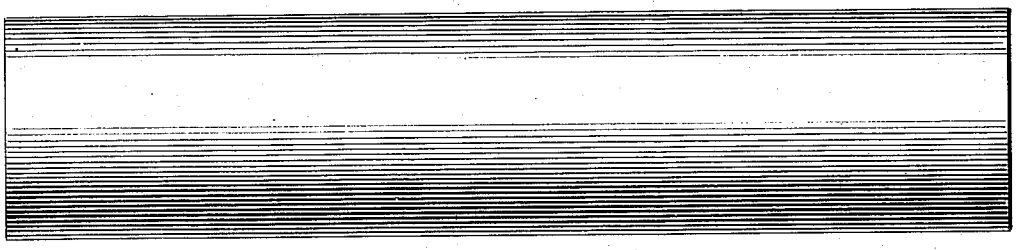


*Fig. 5,*

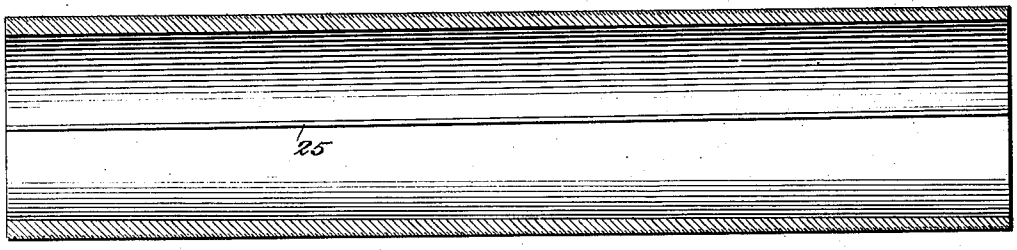
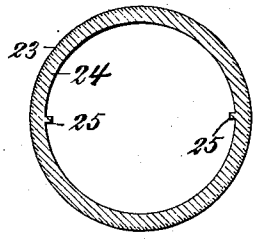



*Fig. 6,*




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# UNITED STATES PATENT OFFICE.

CHARLES GRASSER, OF PASSAIC, NEW JERSEY, ASSIGNOR TO THE AMERICAN LITHOGRAPHIC COMPANY, OF NEW YORK, N. Y.

## PRINTING-SURFACE AND PROCESS OF PRODUCING SAME.

SPECIFICATION forming part of Letters Patent No. 661,142, dated November 6, 1900.

Application filed May 12, 1899. Serial No. 716,481. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES GRASSER, a citizen of the United States, and a resident of Passaic, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Printing-Surfaces and Process of Producing the Same, of which the following is a specification.

This invention relates to printing-surfaces and to a process for producing the same.

The invention seeks, among other things, to produce a curved and preferably cylindrical metallic printing-surface adapted and designed to be used in a rotary printing-press, one that shall be capable of receiving a lithographic transfer and be capable of development into a printing-surface by an etching process or a process which includes etching and one that may be securely and removably mounted in an accurate and predetermined position on a supporting-cylinder in a printing-press.

The invention also seeks to produce a printing-surface of the character described at small cost and to produce a printing-surface by a process which may be carried out conveniently and economically and resulting in a substantially exact and perfect surface in its curvature and evenness and without requiring to be ground or turned.

These and other objects, with their attendant advantages, collectively and separately, are sought by the invention.

Zinc is the metal most desirable for the printing-surface. Difficulties have been encountered, however, in forming suitable curved or cylindrical printing-surfaces of this metal, because it is too short to admit of its being drawn like copper and at the same time secure a surface sufficiently free from blemishes, and great difficulties present themselves for the same reason when it is attempted to cast a zinc printing-surface. By the process herein described, however, a curved or cylindrical printing-surface of zinc or other suitable metal may be made suitable for its purpose and at moderate cost.

In carrying out the process a sheet of metal of proper thickness is rolled or otherwise bent into a curved or cylindrical shape and incased within a casting-chamber having a curved or cylindrical interior accurately formed. Fluid metal is then cast on the inside of the curved metallic sheet and the two metals are caused to adhere, the cast metal forming a rigid backing for the metallic sheet, which is thereby retained in permanent curved or cylindrical shape, the metallic sheet constituting the surface for the printing. By this process cylindrical tubes may be made of any required size—say ten or twelve inches or more in diameter and three or four feet or more in length—and the thickness of the sheet metal, if desired, need not be greater than a sixteenth of an inch and the cast-metal interior need not be more than one-fourth of an inch in diameter. By the use of the metallic sheet all structural blemishes on the exterior surface are avoided. Moreover, by the use of a proper core the interior of the tube or cylinder may be accurately formed and tapered, if desired, so as to exactly fit a supporting-cylinder in a printing-press, and this may be accomplished in the casting and without the necessity of resorting to the difficult and delicate process of boring out the tube.

The invention consists in a printing-surface having the characteristics herein set forth and also in the process for producing a printing-surface as herein set forth.

In the accompanying drawings, forming part of this invention, Figure 1 is a central vertical section of an apparatus generally employed in carrying out the process. Fig. 2 is a transverse section on the line 2 2 of Fig. 1. Fig. 3 is a plan view of a detail of said apparatus. Fig. 4 is a side elevation of a tubular cylindrical printing-surface embodying part of the invention. Figs. 5 and 6 are respectively a longitudinal and a transverse section of the printing-surface shown in Fig. 4.

In carrying out the process of the invention the apparatus shown in Figs. 1, 2, and 3 is preferably employed and will first be briefly described. This apparatus is not herein specifically claimed, because it forms the subject of a separate application executed by me of even date herewith which in the form shown is particularly designed for use in making cylindrical and tubular cylindrical printing-surfaces.

1 is a casting-chamber having a cylindrical

interior substantially perfect in curvature and evenness and having the flanges 2 and 3, between which the cylinder is longitudinally split. The casting-chamber has a removable top or cap 4, in which is secured an eyebolt 5, to which the hoisting-tackle 6 may be attached for raising and lowering the casting-chamber.

7 is a cylindrical receptacle for holding fluid metal and consisting of the two hinged halves 8 and 9. This receptacle is open at its top and is adapted to support the lower open end of the casting-chamber 1. A piston 10 forms the bottom of the receptacle 7 and is carried on a threaded piston-rod 11, mounted on a suitable support 12. This piston-rod has longitudinal movement, but is held from rotation. It is actuated by a hand-wheel 13, which turns a gear-wheel 14, meshing with a gear-wheel 15, internally threaded and loose on the piston-rod 11. When the printing-surface is to be made in tubular form, the removable core 16, generally cylindrical on its exterior surface, is centered within the casting-chamber 1. This core is closed at its bottom, on which it has a central pin 17.

18 is a plate having a central hole to fit on the pin 17, and the peripheral projection 19, adapted to contact with the interior of the casting-chamber and center the lower end of the core 17. The upper end of the core is centered in the chamber 1 by the flange 20 on the cap 4. A movable asbestos lining 21 for the interior of the receptacle 7 is generally employed to prevent the fluid metal from chilling and to form a packing around the piston.

The steps of the process will now be described. A sheet of zinc or other suitable metal accurately cut to the required size is formed, as by bending or otherwise flexing, into a curved shape. Assuming that the printing-surface is to be a complete cylindrical tube, the sheet will be of such size that when formed into cylindrical shape it will be able to exactly fit the interior of the casting-chamber 1, with its edges firmly abutting each other. The cap 4 of the casting-chamber having been removed and the casting-chamber having been sprung open at the longitudinal slit between the flanges 2 and 3, so as to enlarge its interior, the cylindrical metallic sheet is inserted lengthwise through the open upper end of the casting-chamber. The core 16 is then inserted, the cap 4 is fastened in place, and the plate 18 is fixed on the lower end of the core. The flanges 2 and 3 are then brought tightly together and made secure by bolts, this operation bringing the edges of the incased metallic sheet together in firm contact and causing the sheet to exactly and snugly fit and fill the interior surface of the chamber 1. This chamber, which is made of metal, is then put into an oven and raised to about 500° Fahrenheit, after which it is centered over the receptacle 7 and bolted thereto. The receptacle 7, having been previously filled with a suitable fluid metal, preferably type-metal, britannia metal, or some other suitable metal or composition of metal that has little or no contraction in cooling from the melting-point to the solidifying-point, the hand-wheel 13 is turned and the piston rises, thereby forcing the fluid metal up into the tubular space between the core and the metal sheet, the air within the casting-chamber rising through the vent-tube 22. The cast metal is caused to adhere to the metallic sheet by any suitable means—such, for example, as any of the various means known to those skilled in the metal-workers' art—but preferably this adherence is accomplished by coating the inner surface of the metallic sheet with tin or solder before the sheet is put into the casting-chamber. This metallic coating is melted by the hot cast metal and on cooling unites the outer sheet and interior cast body in one integral solid body. As the fluid metal rises from the receptacle 7 it enters the casting-chamber through an annular gate formed between the periphery of the plate 18 and the interior of the casting-chamber. This gate is in line with the cylindrical receptacle 7 and permits and causes the metal to rise in the casting-chamber equally over the inner surface of the metallic sheet, the gate admitting a continuous stream of metal of exactly the same dimension and form as the space within the casting-chamber. When the cast metal has solidified, the casting-chamber is uncoupled from the receptacle 7 and the surplus metal still remaining in the receptacle is removed. The cap 4 of the casting-chamber is then removed and the bolts through the flanges 2 and 3 are loosened. The cylindrical tube then becomes free and may be easily withdrawn, and the head or surplus metal remaining thereon may be removed. The core 16 is then withdrawn from the completed cylinder. The curved or cylindrical printing-surface after it is thus made may subsequently have a design imposed thereon by a suitable process, so as to be ready for use in printing. In imposing this design the lithographic method of transferring is preferably employed, the design being then generally developed partly or entirely by etching.

Referring now to that part of the present invention existing as a product or article of manufacture, Figs. 4, 5, and 6 represent the preferred form of a printing-surface embodying this part of the invention. 23 is an exterior curved sheet of zinc or other suitable metal adapted and designed to have a design imposed thereon. The design is generally imposed by transferring in the lithographic manner and is then developed partly or entirely by etching. 24 is a curved inner body of metal to which the sheet 23 is firmly and solidly secured and forms a backing for the sheet 23. The sheet 23 and body 24 are united into a unitary structure by fusion, a coating of tin or solder being preferably employed for this purpose and being interposed between

the sheet 23 and body 24 and fused so as to bind the two together. The body 24 is preferably a complete cylinder, with the sheet 23 entirely surrounding the body and having its edges meeting in close contact. In the best form the structure is hollow or tubular. This tube is preferably formed with an internal taper, as shown, so that it may be easily forced onto and securely and removably held on a correspondingly-shaped supporting-cylinder of a printing-press or other machine designed to work with or upon the printing-surface. Moreover, the curved or cylindrical printing-surface is generally formed with internal ribs 25, whereby the printing-surface may be always mounted in the same predetermined position on its supporting-cylinder which would have a corresponding recess. Of course instead of the ribs 25 a corresponding recess could be formed on the interior of the printing-surface for the same purpose as the ribs.

When the printing-surface is formed by the process above described and which constitutes a part of this invention, the bore or curved interior and the ribs or recesses will generally be formed by casting. The sheet 23 preferably consists of zinc of such character as is now used in flat sheet form in the lithographic art.

What I claim as new, and desire to secure by Letters Patent, is—

1. The process of making a curved printing-surface adapted and designed to be developed in the lithographic manner, which consists in bending or flexing a sheet of suitable metal into a curved form, casting fluid metal on the interior thereof and causing the cast metal to adhere to the inner surface of said curved sheet, and then transferring a design to said sheet-metal surface and developing it into a surface of the character desired.

2. The process of making a curved zinc printing-surface, which consists in bending or flexing a sheet of zinc into a curved form, casting fluid metal on the interior thereof and causing the cast metal to adhere to the inner surface of the said curved sheet-zinc, and then transferring a design to said sheet-zinc surface and developing it into a printing-surface of the character desired.

3. The process of making a curved sheet-metal printing-surface adapted and designed to be developed in the lithographic manner, which consists in arranging a sheet of suitable metal in a mold having a curved interior so that said sheet is supported in curved form by the interior of the mold, casting fluid metal on the inner surface of said sheet within the mold and causing the cast metal to adhere to the surface of the curved sheet, and then transferring a design to said curved sheet-metal surface and developing it into a printing-surface of the character desired.

4. The process of making a curved zinc printing-surface which consists in bending or flexing a sheet of zinc into a curved form, casting fluid metal on the interior thereof and causing the cast metal to adhere to the inner surface of the said curved sheet-zinc, and then imposing a design upon said zinc sheet.

5. The process of making a curved printing-surface adapted and designed to be developed in the lithographic manner, which consists in bending or flexing a sheet of suitable metal into a curved form, casting fluid metal on the interior thereof and causing the cast metal to adhere to the inner surface of said curved sheet to form a rigid backing therefor and thereby maintain said curved sheet in permanent curved form, and then transferring a design to said sheet-metal surface and developing it into a surface of the character desired.

6. The process of making a curved zinc printing-surface, which consists in bending or flexing a sheet of zinc into a curved form, casting fluid metal on the interior thereof, and causing the cast metal to adhere to the inner surface of the said curved sheet-zinc to form a rigid backing therefor and thereby maintain said sheet-zinc in permanent curved form, and then transferring a design to said sheet-zinc surface and developing it into a printing-surface of the character desired.

7. The process of making a curved sheet-metal printing-surface adapted and designed to be developed in the lithographic manner, which consists in arranging a sheet of suitable metal in a mold having a curved interior so that said sheet is supported in curved form by the interior of the mold, casting fluid metal on the inner surface of said sheet within the mold and causing the cast metal to adhere to the surface of the curved sheet to form a rigid backing therefor and thereby maintain said curved sheet in permanent curved form, and then transferring a design to said curved sheet-metal surface and developing it into a printing-surface of the character desired.

8. The process of making a curved printing-surface adapted and designed to be developed in a lithographic manner, which consists in bending or flexing a sheet of suitable metal into a curved form, casting fluid metal under pressure on the interior thereof and causing the cast metal to adhere to the inner surface of said curved sheet to form a rigid backing therefor and thereby maintain said curved sheet in permanent curved form, and then transferring a design to said sheet-metal surface and developing it into a printing-surface of the character desired.

9. The process of making a curved zinc printing-surface which consists in bending or flexing a sheet of zinc into a curved form, casting fluid metal under pressure on the interior thereof and causing the cast metal to adhere to the inner surface of the said curved sheet-zinc, and then imposing a design upon said zinc sheet.

10. The process of making a curved zinc printing-surface which consists in bending or

flexing a sheet of zinc into a curved form, casting fluid metal under pressure on the interior thereof and causing the cast metal to adhere to the inner surface of the said curved sheet-zinc to form a rigid backing therefor and thereby maintain said sheet-zinc in permanent curved form, and then transferring a design to said sheet-metal surface and developing it into a printing-surface of the character desired.

11. The process of making a curved sheet-metal printing-surface adapted and designed to be developed in the lithographic manner, which consists in arranging a sheet of suitable metal in a mold having a curved interior so that said sheet is supported in curved form by the interior of the mold, casting fluid metal under pressure on the inner surface of said sheet within the mold and causing the cast metal to adhere to the surface of the curved sheet to form a rigid backing therefor and thereby maintain said curved sheet in permanent curved form, and then transferring a design to said curved sheet-metal surface and developing it into a printing-surface of the character desired.

12. The process of making a curved sheet-metal printing-surface adapted and designed to be developed in a lithographic manner, which consists in arranging a sheet of suitable metal in a mold having an inner core and having a curved interior so that the said sheet is supported in curved form by the interior of the mold, casting fluid metal between the inner surface of said sheet and said core within the mold and causing the cast metal to adhere to the inner surface of the curved sheet to form a rigid backing therefor and thereby maintain said curved sheet in permanent curved form, and then transferring a design to said curved sheet metal and developing it into a printing-surface of the character desired.

13. The process of making a hollow cylindrical sheet-metal printing-surface adapted and designed to be developed in a lithographic manner, which consists in arranging a sheet of suitable metal in a mold having an inner removable core and having a cylindrical interior so that said sheet is supported in cylindrical form by the interior of the mold, casting fluid metal under pressure between the inner surface of said sheet metal and the core within the mold and causing the cast metal to adhere to the inner surface of the cylindrical sheet to form a rigid backing therefor and thereby maintain said cylindrical sheet in permanent cylindrical form.

14. The process of making a hollow cylindrical sheet-zinc printing-surface which consists in arranging a sheet of zinc in a mold having an inner removable core and a cylindrical interior so that said sheet is supported in cylindrical form by the interior of the mold, casting fluid metal under pressure between the inner surface of said zinc sheet and the core within the mold and causing the cast metal to adhere to the inner surface of the cylindrical zinc sheet to form a rigid backing therefor and thereby maintain said cylindrical zinc sheet in permanent cylindrical form.

15. The process of making a hollow cylindrical sheet-zinc printing-surface having a tapering bore, which consists in arranging a sheet of zinc in a mold having an inner removable tapering core, and a cylindrical interior so that said sheet is supported in cylindrical form by the interior of the mold, casting fluid metal under pressure between the inner surface of said zinc sheet and the core within the mold and causing the cast metal to adhere to the inner surface of the cylindrical zinc sheet to form a rigid backing therefor and thereby maintain said cylindrical zinc sheet in permanent cylindrical form.

16. A curved printing-surface, adapted and designed to be developed in the lithographic manner, comprising an exterior surface of suitable sheet metal bent or flexed in proper shape, and a curved metal backing permanently united to the said sheet metal by fusion, so that the backing and sheet metal become integral, said sheet metal being held in its curved form by the backing and being developed or partly developed by etching.

17. A curved printing-surface adapted and designed to be developed in the lithographic manner, comprising an exterior surface of sheet-zinc bent or flexed in proper shape, and a curved metal backing permanently united to the said sheet-zinc by fusion so that the backing and sheet-zinc become integral, said sheet-zinc being held in its curved form by the backing and being developed or partly developed by etching.

18. A cylindrical printing-surface adapted to be developed in the lithographic manner, comprising an exterior surface of suitable sheet metal, bent or flexed into a cylindrical shell, the edges of said sheet being brought into contact with each other, and a cylindrical metal backing permanently united to said shell by fusion, so that the backing and shell become integral, said shell being developed or partly developed by etching.

19. A cylindrical printing-surface adapted and designed to be developed in the lithographic manner, comprising an exterior surface of sheet-zinc, bent or flexed into a cylindrical shell, the edges of said sheet being brought into contact with each other, and a cylindrical metal backing permanently united to said shell by fusion, so that the backing and shell become integral, said shell being developed or partly developed by etching.

20. A hollow cylindrical printing-surface adapted and designed to be developed in the lithographic manner, comprising an exterior surface of suitable sheet metal, bent or flexed into a cylindrical shell, the edges of said sheet being brought into contact with each other, and a hollow cylindrical metal back-

ing permanently united to the said cylindrical shell by fusion so that the backing and sheet metal become integral, said backing operating to maintain said bent sheet in its cylindrical form.

21. A hollow cylindrical printing-surface adapted and designed to be developed in the lithographic manner, comprising an exterior surface of sheet-zinc bent or flexed into a cylindrical shell, the edges of said sheet being brought into contact with each other, and a hollow cylindrical metal backing having a tapering bore permanently united to the said cylindrical shell by fusion so that the backing and sheet-zinc shell shall become integral, said backing operating to maintain said bent sheet in its cylindrical form.

22. A hollow cylindrical printing-surface comprising an exterior surface of sheet-zinc bent or flexed into a cylindrical shell, and a hollow tapering cylindrical metal backing having a tapering bore permanently united to said cylindrical shell by fusion, so that the backing and sheet-zinc shell become integral, said backing operating to maintain said bent sheet in its cylindrical form and having internal ribs or equivalent means for mounting it in a predetermined position upon a cylindrical support.

23. The process of making a curved printing-form which consists in arranging a sheet of suitable metal, bent or flexed into a curved form, within a mold having a curved interior so that said sheet accurately fits the interior of the mold and is thereby supported in curved form; casting fluid metal on the inner surface of the curved sheet and causing the cast metal to adhere thereto and form a rigid backing for the curved sheet and thereby maintain it in permanent curved form, and then imposing a design upon the exterior surface of the curved sheet metal.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES GRASSER.

Witnesses.
GEO. H. BARNES,
EDWIN SEGER.