

No. 637,561.

Patented Nov. 21, 1899.

E. HETT.

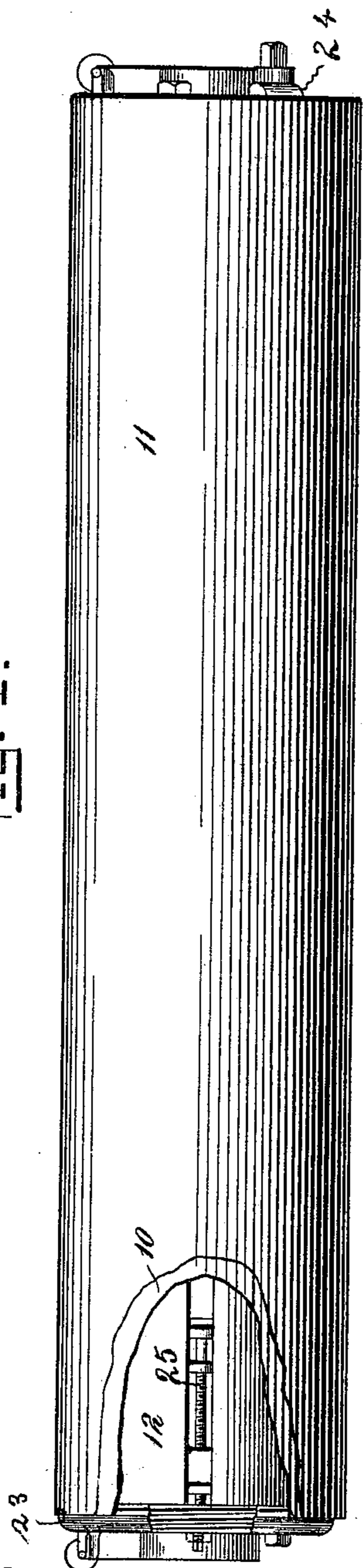
PRINTING FORM AND PRINTING PRESS.

(Application filed Nov. 1, 1899.)

(No Model.)

3 Sheets—Sheet 1.

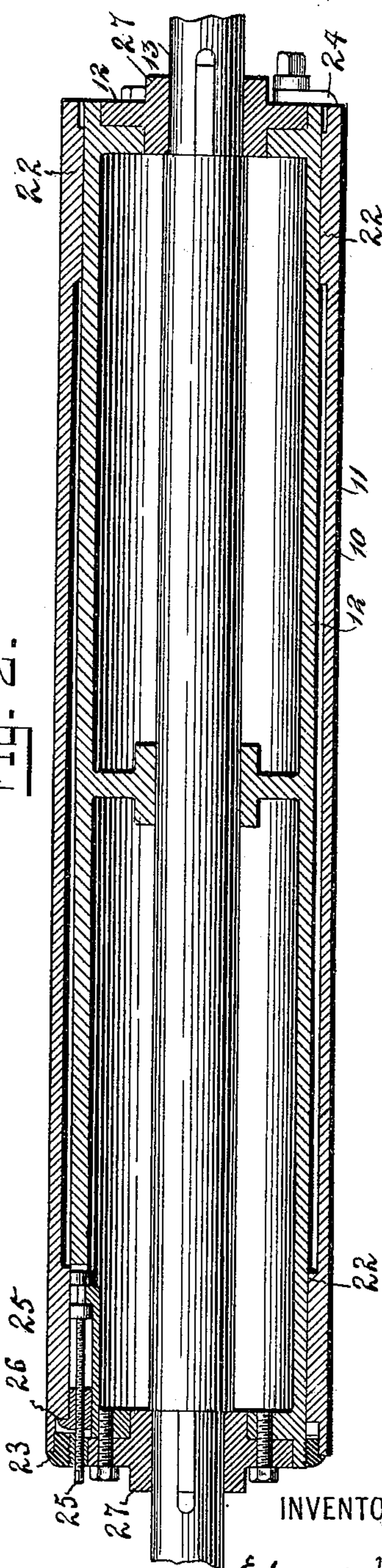
Fig. 1.



WITNESSES:

F. N. Roebuck
Edwin Seger

Fig. 2.



INVENTOR

Edward Hett

BY

Kennyon & Kennyon
ATTORNEYS

No. 637,561.

Patented Nov. 21, 1899.

E. HETT.

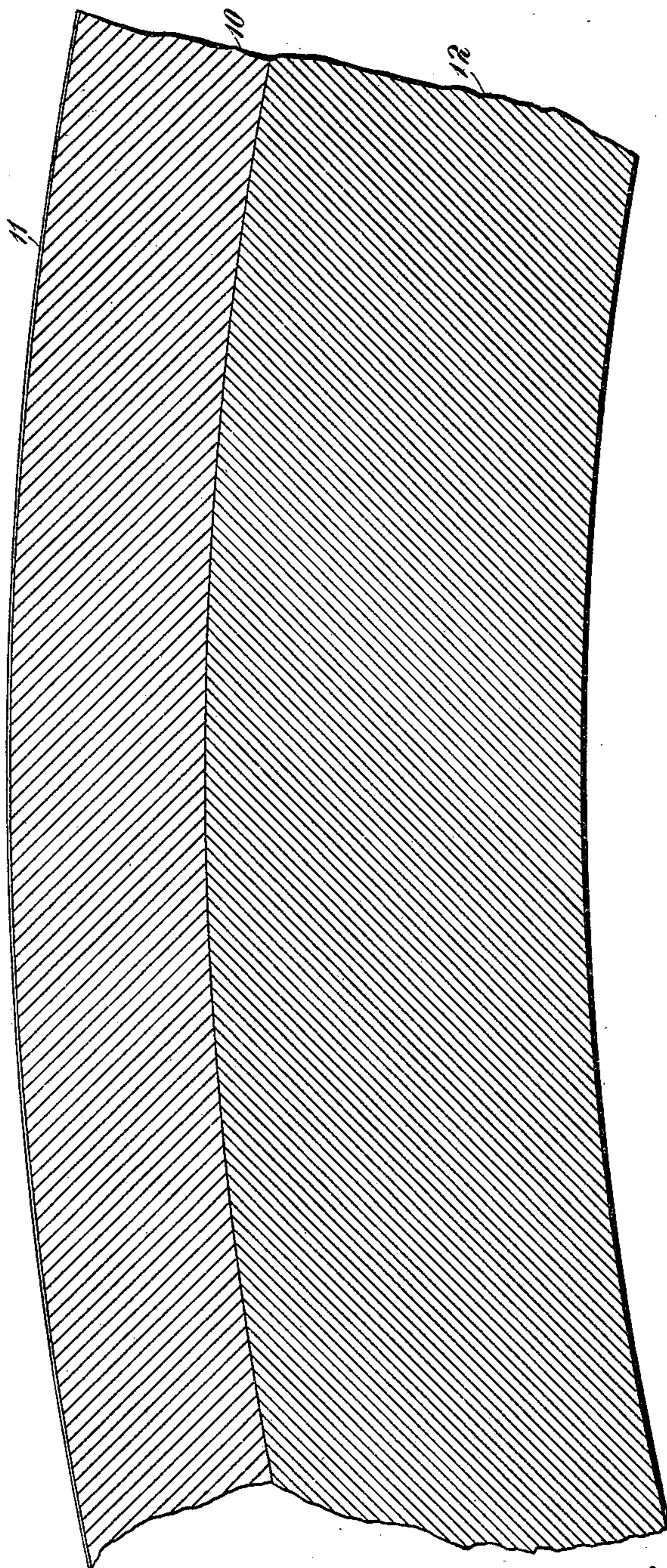
PRINTING FORM AND PRINTING PRESS.

(Application filed Nov. 1, 1899.)

(No Model.)

3 Sheets—Sheet 2.

Fig. 2.



WITNESSES.

F. N. Roehrich
Edwin Seger

INVENTOR

Edward Hett

BY

Kenyon & Kenyon
ATTORNEYS

No. 637,561.

Patented Nov. 21, 1899.

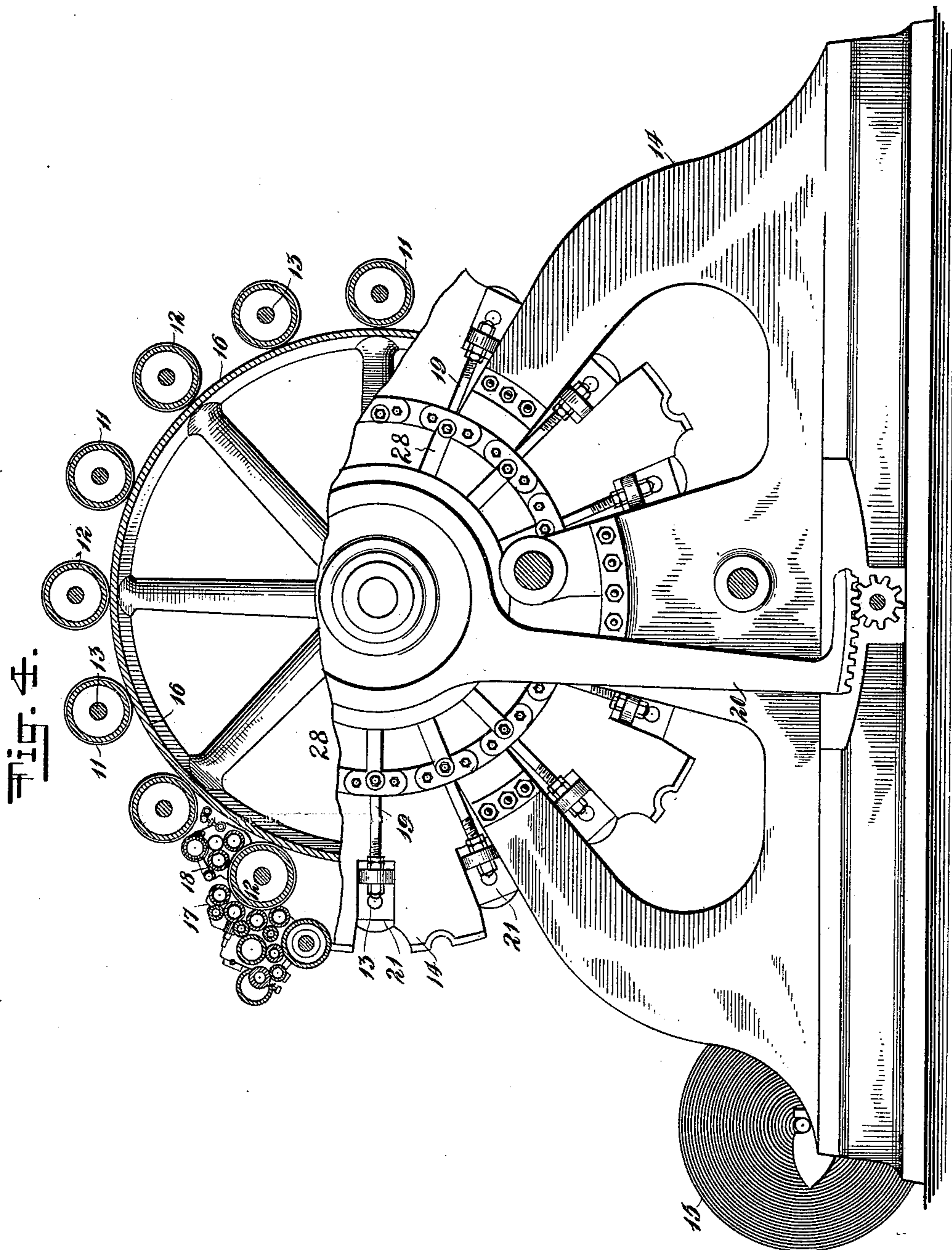
E. HETT.

PRINTING FORM AND PRINTING PRESS.

(Application filed Nov. 1, 1899.)

(No Model.)

3 Sheets—Sheet 3.



WITNESSES:

F. N. Roehrich
Edwin Seges

INVENTOR

Edward Hett

BY

Kempson & Kempson
ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD HETT, OF NEW YORK, N. Y.

PRINTING-FORM AND PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 637,561, dated November 21, 1899.

Application filed November 1, 1899. Serial No. 735,445. (No model.)

To all whom it may concern:

Be it known that I, EDWARD HETT, a citizen of the United States, residing at New York, (New Dorp, Staten Island,) in the county of Richmond and State of New York, have invented certain new and useful Improvements in Printing-Forms and Printing-Presses; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to apparatus for printing, and especially planographic and lithographic printing, and to the constructions and combinations and manipulations of the printing-forms.

It has for its object to improve the character and reduce the cost of printing, and especially planographic and lithographic printing, and to make possible and practicable and economical and successful multicolor planographic and lithographic printing, especially on the rotary-press principle.

It consists of the combinations hereinafter claimed.

In more detail the invention relates to a printing-form, and preferably to a planographic-printing form adapted to receive a lithographic drawing or transfer and to be thereafter developed into a printing-surface for that design of the character desired, the printing comprising a suitable base, the base having a separate removable coating thereon, preferably thin, adapted to be made into a printing-surface, which coating is substantially integral with the base and yet can be removed from and then renewed on the base, a fresh unused printing-surface being nevertheless presented by this printing-form for each new picture or design; also making the base of different material from the printing-surface; also making the base curved instead of flat; also making it circumferentially continuous and curved; also making it hollow; also making the printing-surface of zinc; also of electrodeposited material, preferably of electrodeposited zinc; also making the base of predetermined shape and dimensions, preferably fixed and thereafter permanently maintained, so as to permanently adapt the form to the coöperating parts of the press;

also making the coating removable without substantially affecting the shape and dimensions of the base; also combining such a printing-form in series with other similar forms and with an impression mechanism; also combining such a printing-form with a form-support, and this combination also in series; also applying a coating of predetermined thickness to a base of predetermined size; also combining a series of such printing-forms with an impression mechanism; also a hollow composite planographic-printing form adapted to receive a lithographic drawing or transfer comprising a hollow strengthening-base, a separate removable coating thereon adapted to be made into a printing-surface, which coating is substantially integral with the base; also making the base in that case of different material from the printing-surface; also making the base curved; also making it circumferentially continuous and curved; also making the printing-surface of zinc; also of electrodeposited material; also combining such a printing-form in series and with interior form-supports; also making such printing-forms cylindrical; also combining such printing-forms with an impression-drum; also with suitable inking mechanisms; also with suitable dampening mechanisms.

The invention also consists of other features which are specially set out in the claims.

The accompanying drawings show apparatus for planographic or lithographic printing embodying the invention in the best form at present known to me.

Figure 1 is a perspective view of the composite printing-form before the design has been transferred to it, certain parts being broken away at one end. It shows the printing-form as hollow and cylindrical and as applied to and in place upon an interior form cylinder or support. Fig. 2 is a longitudinal sectional view taken through the axis of the device shown in Fig. 1 with the shaft of the transfer or printing press in place in the form-support. Fig. 3 is an enlarged sectional view of a small portion of the printing-form in place upon a form-support. The section is taken at right angles to the axis of the form-support. Fig. 4 shows diagrammatically a multi-color planographic press in which a se-

ries of the printing-forms, each with its carrying form-support, is mounted.

The composite printing-form will be first described in the form in which it is specifically shown in the drawings.

Referring to Fig. 3, the printing-form as there shown consists of a hollow base 10, preferably of copper, exteriorly cylindrical in shape and about one-quarter of an inch thick, and a separate removable coating 11, adapted to be made into a printing-surface, preferably of electrodeposited zinc. The copper base 10 is a hollow tube that is cylindrical and of accurate shape and size and finish and polish on the outside and is slightly tapering on the inside. The outer surface of the copper shell has in its making been turned and polished with absolute accuracy as to shape and size, so as to present a true cylinder of the proper predetermined printing shape and diameter (when the printing-surface is upon it) to cooperate with the impression-surface in the printing operation, for it is through this base that the working shape and size of the printing-form are secured and permanently maintained. The coating or surface may be of any suitable material and may be applied in any suitable way. The preferred material is zinc, and it is preferably applied by electrodeposition upon the outer surface of the copper base 10 after the latter is completed in such a way as to adhere to the cylindrical copper base and to become substantially integral therewith, by which is meant that the surface and base are united together sufficiently to make one part move with the other and practically constitute one piece of metal, and to form thereon a layer or coating, preferably in any given case of predetermined thickness, preserving the shape of the base and constituting thereon a printing-surface. This zinc layer or surface must be substantial enough to reliably constitute the desired printing-surface, and in any given case should be and preferably is of a predetermined thickness, so as faithfully to produce, when combined with a base of predetermined size, the accurately-shaped printing-surface required and the exact size required, adapting the composite printing-form as a whole to properly cooperate with the other parts of the press in attaining register and printing accurately. Fig. 3 indicates such a surface layer 11. I have found that the thickness of deposit obtained under the conditions specifically set out hereinafter is admirably adapted to make the construction herein described suitable for planographic printing. The copper shell 10 is preferably made to be slightly tapering or conical on the interior in order that it may absolutely and exactly fit the form-supporting cylinder 12 and may be supported substantially at every point by that form-support and yet may be readily removed from and replaced upon said support. The printing-form is preferably accurately adjusted and reliably held, both longitudinally and circumferen-

tially, with relation to the other parts of the press.

The means for accurately adjusting both longitudinally and circumferentially and reliably holding the printing-form upon the form-support and the latter upon the shaft of the press, as well as the means for removing the printing-form from the form-support and the form-support from the shaft, are indicated in Figs. 1 and 2; but their details form no part of the present invention, being claimed in other pending applications. The printing-form is held in place circumferentially on the form-support by the spline 22 of the former taking in a longitudinal groove in the latter, and it is held in place longitudinally against the adjustable stop 23 by the clamps 24. To remove the printing-form from the form-cylinder, release the clamps 24 and then turn the threaded bolt 25, on which is a traveling finger 26, which takes against the printing-form, starting it off the form-cylinder. To remove the form-cylinder from the shaft, unkey one or both hubs 27 from the shaft, unscrew the other hub from the form-cylinder, and slip the latter off.

It will be observed that the printing-form (shown in Figs. 1, 2, and 3) has a circumferentially-continuous curved surface for printing. It will also be observed that the printing-form is a hollow composite structure having a surface of suitable printing material and a hollow strengthening-base of a different material, the two being integrally united together. It will also be observed that this hollow composite printing-form is removable from and replaceable on an interior form-support and that the form-support is removable from and replaceable on the shaft 13 of the press. It will also be noted that in constructing the composite printing-form the copper shell or strengthening-base is constructed of a predetermined shape and dimensions that are fixed, so as to permanently adapt the form to the cooperating parts of the press, and to that end the inner and outer surfaces of the copper base are with great care trued and turned and polished and cleansed with substantial accuracy to the exact diameter that will adapt the printing-form as a whole when finished to the press and will reliably and permanently attain and maintain the proper support and the proper printing and register in the printing-press, and especially when a whole series of such printing-forms are mounted successively, as shown in Fig. 4, and print successively and in approximately instantaneous succession in color on top of one another, as in a multicolor-press. It will also be noted that when a series of such printing-forms are combined in a press it will not be essential that all the forms be of the same predetermined size, as one form may be a multiple of another, or, if a series of designs of the same size circumferentially or a series of design groups of the same size circumferentially are arranged circumferentially on one form, the circumfer-

ence of another form might equal that fraction of the first form occupied by one design or a group of designs or a multiple of such fraction. All that is essential is that each form should be of a predetermined relative size such that the design or designs carried by the form will print in register with the design or designs carried by the other forms. It will also be noted that when a base is thus once accurately shaped and sized such a thin removable coating or surface may be applied thereto as not to materially alter the predetermined size and shape of the base, in which case a printing-form of substantially the same predetermined size and shape as the base is obtained, which will properly cooperate with a similar form or forms and print in register in a press. Preferably, however, a predetermined thickness of removable coating or printing-surface is applied to the accurately shaped and sized base, thereby obtaining a printing-form of predetermined size and shape, the size of which, though different from that of the base, is determined by the size of the base. It will also be noted that while the thickness is preferably predetermined it need not be the same for all the forms to be used in cooperation in a press—as, for instance, where a series of bases are of different proportions, as above set forth, the thickness of the coatings would vary in the same proportions. It will also be noted that the thickness of coating on one cooperating series of printing-forms need not be the same as the thickness of coating on another series, even though the same bases be used in different series or even though the different series be used in the same press. When, however, one of a cooperating series of printing-surfaces becomes worn or for any other reason needs to be replaced if the old base or another of the same predetermined size is used, the new coating must be of the same predetermined thickness as the old one. It will also be noted that where a coating of substantial thickness is applied to a base of predetermined size and shape its thickness in lineal measure need not be known, as the thickness may be determined in any suitable way, it only being essential to determine the relative thickness of the coatings to be applied to a series of bases having predetermined relative sizes, which, with their coatings, are to form a cooperating series of printing-forms adapted to print in register in a press.

When a zinc coating is applied by electro-deposition, its thickness may be and preferably is determined either theoretically or experimentally in the plating-bath by employing a standard of solution, of current, of time, and of character of manipulation in the bath, all of which can be worked out or determined experimentally by the practical printer and may vary greatly. Although the thickness of the coating may vary, as above set forth, I have found that a half-hour's treatment in the zinc-bath with a suitable solution and cur-

rent produces a satisfactory thickness of zinc surface on the smooth exterior of a copper tube and provides a satisfactory surface for the purposes of planographic printing. Although the thickness of this zinc exterior surface in lineal measure need not be known, for reasons above noted, it has been found when made under the above conditions to be approximately two one-thousandths of an inch, more or less. It is to be noted that a mere change of the color of the cylinder in the bath from copper color to zinc color is ordinarily not enough to produce good results in planographic printing. Such a change of color occurs at once, and it is quite complete in a minute or two under the conditions of solution and of current, of which I have found a full half-hour's treatment the best, as already stated. For the purposes of relief-printing (where a planographic surface, for example, after the design is transferred to it is developed, as by deep etching, into a relief-surface) the zinc surface should be thicker than is necessary for planographic printing. It is desirable also in case of cylindrical tubes that the deposit should be uniform in thickness, and to that end I have found it necessary, in the case of cylindrical printing-tubes, to keep the same in slow constant rotation underneath the surface of the bath and equally opposite the anodes. It is also to be noted that the character of the deposit is preferably such as will at once adapt the surface to receive a lithographic drawing or transfer to be thereafter developed into a printing-surface for that design of the character desired. In this way a fresh and unused separate printing-surface can without difficulty be applied to the outer polished surface of a given basic copper tube time after time with such accuracy as to thickness, &c., that the resulting succession of composite printing-forms will reliably and accurately cooperate with the other parts of the same press and register with one another in the printing without remeasurements or readjustments or reconstruction. Thus if the entire printing-surface is removed from the copper base after a printing job is finished without removing any of the copper base (but instead preserving its original integrity of shape) then a fresh printing-surface of predetermined thickness can be renewed on the same base, thereby producing a new printing-form of predetermined size, while, as above set forth, the predetermined thickness of the coating and the predetermined size of the base may be varied as desired. I find in practice that it is more economical and also that better and more reliable results are obtained when the size and dimensions of the base are predetermined and fixed and the renewed coating is of the same predetermined thickness as the one taken off. When the form is so constructed, it will be noted that the removal and renewal of the printing-surface are accomplished without substantially affecting

the shape or dimensions of the printing-form as they existed before such removal and renewal. I also find it preferable in practice to make the series of bases intended to co-
 5 operate in a press all of the same predetermined size and always apply to them and renew on them a coating of the same predetermined thickness, as by such construction a series of identical and interchangeable printing-forms are provided, which can be applied
 10 to the same support or to different supports in the same press or in duplicate presses without discrimination or confusion or liabilities of error in the attainment of register. It will
 15 also be seen that when for a given press (multicolor or otherwise) a copper base has once been accurately and painstakingly shaped and sized and finished and adapted with a view to its exact adaptation to print and register in that press after receiving a separate
 20 printing-surface of a predetermined thickness then an indefinitely numerous succession of printing-forms may readily and economically be made therewith without any further adjustments or adaptations being required, and each with a fresh and unused
 25 printing-surface, and simply by removing from said base and integrally renewing thereon the separate removable printing-surface, as described, and that this can be done while
 30 employing such materials for the different parts of the composite printing-form and such a shape of printing-form as to combine strength with lightness without sacrificing
 35 surface printing character, whereby ease of handling off the press and absolute integrity of shape on and off the press are combined, and both with cheapness and convenience in the constructing and preparation of the printing-forms.
 40

My improvements render multicolor planographic printing practicable, solving many of the most serious problems that have stood in the way of the practicable attainment of that
 45 end.

Fig. 4 represents a multicolor planographic printing press, showing combinations in which my improvements are of especial value and advantages and have peculiar coöperations and results. 14 is the frame of the machine. 15 is the paper-roll. 16 is the impression-drum. 11 are the series of composite printing-forms arranged on the impression-face of the drum. 12 are the series of form-supports; 13, the series of shafts carrying the form-supports; 17, the groups of inking-rollers, one group for each printing-form; 18, the groups of dampening-rollers, one group for each printing-form; 19, the pressure-bars for
 50 moving the printing-forms into and out of contact with the impression-drum when operated to that end by the lever 20 through suitable knuckle-joint levers 28. The detail mechanisms of this printing-press form no
 55 part of the present invention, but are claimed in other pending applications. The shafts 13 are carried in sliding boxes 21, which are se-

cured to the pressure-bars 19. When it is desired to remove the form-supports or printing-forms from the press, the nuts on the outer
 70 ends of the pressure-bars 19 are unscrewed and the sliding boxes are slid off the ends of the pressure-bars and out of their slideways in the frame of the shaft 13, and the printing-form and the form-support can be taken off
 75 of the shaft or the printing-form alone can be slipped off. It will be observed that the printing-forms are arranged in series around the impression-face of the drum and are carried in proper position by a series of form-supports
 80 arranged around the impression-drum. It will also be observed that the accurately-maintained diameter of the printing-forms and their absolute uniformity of surface and their strong and reliable support by the form-supports against bending or yielding at any point
 85 enable accurate and registering and rapid printing to be done with uniformity of pressure and perfection of work and with economy of manipulative preparation for the work. When the entire edition is printed,
 90 the printing-forms are removed from the press, the old design or the ink thereof is washed off with turpentine or benzine in the usual way, and the printing-forms are then
 95 washed with a suitable dilute acid or other agent, such as will remove the coating which had acted as the printing-surface and leave the material of the base untouched, and therefore unaltered in shape or size or character
 100 of surface. I have found that this can be practically and economically accomplished in the case of a zinc surface upon a copper shell by the use of dilute nitric acid run quickly over the zinc surface with a sponge
 105 or brush and washed off with an abundance of water at once. Every trace of zinc can be thus removed in a few seconds from a large copper tube, as will be indicated by the color. I then quickly rub the copper surface with
 110 a little powdered pumice to clean it, and when it is perfectly bright and clean it is plunged into the zinc-bath under the same conditions as before to receive another planographic coating of zinc, which, as already described,
 115 may be and preferably is of the same predetermined thickness as before. It is then mounted in the transfer-press and a new design is suitably transferred to it, and it is etched and prepared for printing as before.
 120 The desired edition of the new design is printed from it in the same printing-press as before, and the zinc printing-surface is removed again by washing with suitable acid, as before, when a third fresh and unused zinc
 125 printing-surface is applied electrolytically under the same conditions as before, and so on. After the design or drawing has been transferred in the lithographic or in any suitable manner to the fresh planographic surface of the printing-form that surface may
 130 be developed into a printing-surface for that design of any desired character. For example, it may be developed by the ordinary light

etching employed in lithography into a planographic-printing surface for that design, and I prefer to so develop it; but it may also equally be developed by deep etching and by
 5 suitable use of a routing-out machine into a relief-printing surface for the design. In the latter case dampening mechanisms are not required in the printing-press. The etching or routing should of course not be deep
 10 enough to cut into the copper base. In both cases and equally the parts of the original planographic surfaces that in the developed printing-surfaces do the actual printing lie all of them in the same plane—to wit, the plane
 15 of the original planographic surface when it received the transfer prior to its development into a printing-surface.

I have shown in the drawings and described heretofore in connection with the drawings
 20 the invention in the best form in which it is at present known to me. Many changes and modifications, however, might be made without departing from the invention, as will be indicated by the omission as well as by the
 25 inclusions of the claims hereinafter made. I have specifically described the best methods and apparatus known to me for carrying out the invention; but for the purposes of many of the claims hereinafter made I do not wish
 30 to be limited to those specific details.

Among the advantages of the invention, especially when embodied in its preferred form, are these: the base of the printing-form, which gives accuracy and integrity of
 35 shape and size and gives body and stability and support to the outer or printing part or surface, may be made of material which would not be suitable for a printing-surface or adapted to receive a drawing or transfer in a litho-
 40 graphic manner or to be thereafter developed into a printing-surface of the character desired, but which may nevertheless be better, giving permanency and durability, and for shape and size giving and strength-giving
 45 purposes, and the outer or printing part or surface upon it, which must be made of material suitable for and in a condition suitable for printing, may be thin, so that while an-
 50 swering fully the purposes of a planographic surface for receiving a transfer of a design and being developed into a printing-surface for that design of the character desired and for the printing of the full edition of one de-
 55 sign, it may then readily and economically be wholly effaced or removed, as by acid, from the inner part or body or base, and an entirely new and fresh outer part or surface of the material suitable for the printing may be applied to or removed from the base as at
 60 first, and this effacement and renewal of the outer surface of the composite printing-form may be repeated an indefinite number of times and for every new design, and mean-
 65 while shape and size and register having been once attained are reliably and economically maintained. The advantage in such case of

having the inner body-giving part or base of the printing-form made of different material from the outer part or printing-surface, is that by a proper selection of effacing or removing
 70 agents, as of acid, the outer surface may be wholly taken off or removed (after each printing job is printed) without taking off any of the inner body-giving base, and thus uniform and reliably uniform working dimensions of
 75 the composite printing form or cylinder, when it is ready for its printing work, can be attained and maintained, a matter of moment and importance especially in any effort to apply the rotary-press principle to plano-
 80 graphic or relief printing work. Thus solid and substantial and unyielding printing-forms reliably maintaining their absolute integrity of predetermined shape and size, especially under the vicissitudes of removing
 85 and renewing printing-surface, the strains of handling out of the presses, and the pressures of use in the transfer and printing-presses, may be attained with great economy of surface material and with a clean unused
 90 fresh planographic surface for each new design or job of printing, and these advantages, with others with the hollow composite printing form or tube, may be attained without sacrificing the solid unitary integral charac-
 95 ter of the hollow composite form or tube as a whole.

In that form of the invention in which the zinc printing-surface is applied by electro-
 100 deposition the zinc, when properly so applied, is preferably thin, may be made continuous over the entire surface, is adherent to and integral with the copper and coherent throughout its own mass, is suitably absorbent, even and uniform without corrugations or streaks
 105 or ruts or nodules, is pure and clean, and has a surface condition admirably adapted to the requirements of planographic transferring, and this at once and without the necessity of any sand-blasting process or other mechanical
 110 or chemical manipulations or preparations.

In that form of the invention in which the base is of one material, as of copper, and a printing-surface is of another, as of zinc, there is the especial advantage that the printing-
 115 surface may be quickly and readily removed or effaced without removing any of the base by the selection of an acid which, under the conditions of its application, will attack the one and not the other. Another advantage
 120 is that the workman can by the difference in color readily know when the printing-surface is entirely removed. Other advantages have been stated heretofore. In that form of the invention in which the printing-surface when
 125 secured is curved and circumferentially continuous special advantages reside. Every part of the surface may be utilized. The endless rolling contact characterizing the printing gives rapid and perfect results. The
 130 printing-forms may be used interchangeably, which is especially important in multicolor-

presswork. A large variety of designs can be printed. Register can be more easily obtained.

In that form of the invention in which the peculiar printing-form is combined with an interior form-support certain special and peculiar advantages are at hand. Solidity and strength and reliability in the working parts with lightness and cheapness and perfection of printing-surface and ease of manipulations of the same are attained, and especially in the combinations involving a series of form-supports and a series of printing-forms are the full and final benefits and advantages found. The development of my planographic surfaces having a design transferred to them into planographic-printing surfaces contribute also toward a great advance in the art of planographic or lithographic printing.

By my invention the process of simultaneously printing of many colors by as many different printing-forms in one and the same press is made possible and practicable in the printing art, and especially in the planographic-printing art. The advantages of this printing in approximately instantaneous succession of many different colors, as, say, fifteen, in the planographic art, and especially in lithography, are such as to make the change revolutionary in the art. The results which are secured in efficiency, capacity, and economy are greatly in advance of anything known in the art. A single press, such as shown in the drawings, Fig. 4, will do the work and take the place of fifteen presses of the kind now in use in printing lithographs in fifteen colors—that is to say, this one press will print fifteen colors simultaneously, while this work will require fifteen presses of the present style, each one working separately and printing a separate color. Moreover, so much time is saved in the handling of the prints that it is estimated that such a press, as shown in Fig. 4, will print about four thousand seven hundred complete fifteen-color lithographs in the same time that it would require one of the present-style presses with the ordinary flat stone and the reciprocating bed to print seven hundred copies in a single color. The capacity of the multicolor-press printing fifteen colors in approximately instantaneous succession will therefore be seen to be about one hundred times greater than that of the old presses in printing a fifteen-color job. In addition to this further economy is secured in the matter of space for the presses, in the matter of labor in handling the presses and the prints between printings, and in the matter of time in turning out the work.

The present invention attains in the best way known to me the peculiarity of a curved lithographic-printing form having a circumferentially continuous or unbroken lithographic-printing surface, with the result of making rotary press-printing for multicolor lithographic work possible and practicable.

My improved method or process set forth

herein is not claimed in this application, but is made the subject of another application filed simultaneously herewith.

I claim—

1. A printing-form comprising a suitable base, the base having a coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and is entirely removable and renewable upon the base for each new design.

2. A printing-form comprising a suitable base, the base having a thin coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and is entirely removable and renewable upon the base for each new design.

3. A printing-form comprising a base of predetermined shape and dimensions, the base having a separate printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

4. A printing-form comprising a base of predetermined shape and dimensions, the base having a separate planographic surface, of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each design, the surface being adapted to receive a drawing or transfer of a design and to be thereafter developed into a printing-surface for that design of the character desired.

5. In a press the combination with a suitable impression-surface of a printing-form comprising a base of predetermined shape and dimensions, fixed so as to adapt the form to the cooperating parts of the press, the base having a separate printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

6. In a press the combination with a suitable impression-surface of a printing-form comprising a base of predetermined shape and dimensions, fixed so as to adapt the form to the cooperating parts of the press, the base having a separate planographic surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design, the surface being adapted to receive a drawing or transfer of a design and to be thereafter developed into a printing-surface for the design of the character desired.

7. A printing-form comprising a base of predetermined shape and dimensions, the base having a separate zinc printing-surface

of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

8. A printing-form comprising a base of predetermined shape and dimensions, the base having a separate, zinc planographic surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design, the surface being adapted to receive a drawing or transfer of a design and to be thereafter developed into a printing-surface for that design of the character desired.

9. A printing-form comprising a base of predetermined shape and dimensions, the base having a separate electrodeposited printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

10. A printing-form comprising a base of predetermined shape and dimensions, the base having a separate electrodeposited planographic surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design, the surface being adapted to receive a drawing or transfer of a design and to be thereafter developed into a printing-surface for that design of the character desired.

11. A printing-form comprising a base of predetermined shape and dimensions, the base having a separate printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design, the base being of different material from the printing-surface.

12. A printing-form comprising a base of predetermined shape and dimensions, the base having a separate planographic surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design, the base being of different material from the printing-surface.

13. A printing-form comprising a curved base of predetermined shape and dimensions, the base having a separate curved printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be removed from the

base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

14. A printing-form comprising a curved base of predetermined shape and dimensions, the base having a separate curved planographic surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design, the surface being adapted to receive a drawing or transfer of a design and to be thereafter developed into a printing-surface for that design of the character desired.

15. A printing-form comprising a circumferentially-continuous curved base of predetermined shape and dimensions the base having a separate circumferentially-continuous curved printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

16. A printing-form comprising a circumferentially-continuous curved base of predetermined shape and dimensions, the base having a separate circumferentially-continuous curved planographic surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design, the surface being adapted to receive a drawing or transfer of a design and to be thereafter developed into a printing-surface for that design of the character desired.

17. A printing-form comprising a hollow base of predetermined shape and dimensions, the base having a separate printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

18. In a printing-press the combination with a suitable impression mechanism of a series of printing-forms adapted to be mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising each a base of predetermined shape and dimensions, the base having a separate printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

19. In a printing press, the combination with suitable impression mechanism of a series of planographic-printing forms adapted to be mounted in the press in a cooperating rela-

tionship to the impression mechanism and to one another, the printing-forms comprising each a base of predetermined shape and dimensions, the base having a separate printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

20. In a printing-press the combination with suitable impression mechanism, of a series of printing-forms adapted to be mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising each a base of predetermined shape and dimensions, the base having a separate electrodeposited printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

21. In a printing-press the combination with suitable impression mechanism of a series of planographic-printing forms adapted to be mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising each a base of predetermined shape and dimensions, the base having a separate electrodeposited planographic-printing surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

22. In a printing-press the combination with suitable impression mechanism of a series of curved printing-forms adapted to be mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising each a base of predetermined shape and dimensions, the base having a separate curved printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

23. In a printing-press the combination with suitable impression mechanism of a series of printing-forms adapted to be mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising each a base of predetermined shape and dimensions, the base having a separate printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

sign, and mechanism for moving the impression mechanism and the series of printing-forms into and out of cooperation.

24. In a printing-press the combination with suitable impression mechanism of a series of printing-forms adapted to be mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising each a base of predetermined shape and dimensions, the base having a separate printing-surface of predetermined thickness thereon which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design, and mechanism for separating the printing-forms and impression mechanism and for bringing them together again in the same cooperating relation.

25. In a printing-press the combination with suitable impression mechanism of a series of suitable form-supports carrying the printing-forms, of a series of exterior removable and replaceable hollow printing-forms adapted to be mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising each a hollow base of predetermined shape and dimensions, the base having a separate printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design, and mechanism for moving the impression mechanism and the series of printing-forms into and out of cooperation.

26. In a printing-press the combination with an impression-drum and a series of form-supports arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of printing-forms removable from and accurately replaceable on the form-supports, the printing-forms comprising each a base of predetermined shape and dimensions, the base having a separate printing-surface of predetermined thickness thereon, which surface is substantially integral with the base and which may be entirely removed from the base and be renewed thereon, to present a fresh surface of predetermined size for each new design.

27. A printing-form comprising a suitable base, the base having a deposited coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and which is entirely removable and renewable upon the base for each new design.

28. A printing-form comprising a suitable base, the base having a deposited metallic coating thereon, which coating is substantially integral with the base and is adapted

to be made into a printing-surface and which is entirely removable and renewable upon the base for each new design.

29. A printing-form comprising a suitable base, the base having a planographic coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and which is entirely removable and renewable upon the base for each new design.

30. A printing-form comprising a suitable base, the base having a thin electrodeposited coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and which is entirely removable and renewable upon the base for each new design.

31. A printing-form comprising a suitable base, the base having a thin electrodeposited planographic coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and which is entirely removable and renewable upon the base for each new design.

32. A printing-form comprising a suitable base, the base having an electrodeposited zinc planographic coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and which is entirely removable and renewable upon the base for each new design.

33. A printing-form comprising a suitable base, of predetermined shape and dimensions, the base having a thin coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and which is entirely removable and renewable upon the base for each new design, the size of the form being determined by the size of the base.

34. A printing-form comprising a suitable base of predetermined shape and dimensions, the base having a thin deposited coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and which is entirely removable and renewable upon the base, for each new design, the size of the form being determined by the size of the base.

35. A printing-form comprising a suitable base, of predetermined shape and dimensions, the base having a thin planographic coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and which is entirely removable and renewable upon the base, for each new design, the size of the form being determined by the size of the base.

36. A printing-form comprising a suitable base, of predetermined shape and dimensions, the base having a thin electrodeposited zinc planographic coating thereon, which coating is substantially integral with the base and is adapted to be made into a printing-surface and which is entirely removable and renewable upon the base, for each new design, the

size of the form being determined by the size of the base.

37. A printing-form comprising a base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable planographic surface thereon, which surface is substantially integral with the base and is adapted to receive a drawing or transfer of a design to be thereafter developed into a printing-surface for the design of the character desired, and which surface can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

38. A printing-form comprising a base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

39. A planographic-printing form comprising a base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

40. A planographic-printing form comprising a base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable electrodeposited printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

41. A planographic-printing form comprising a base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape and dimensions of the form, the base being of different material from the printing-surface, substantially as and for the purposes set forth.

42. A planographic-printing form comprising a base of predetermined shape and di-

mensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable electrodeposited zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, the base being of different material from the printing-surface, substantially as and for the purposes set forth.

43. In a press, the combination, with a suitable impression-surface, of a printing-form comprising a curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape and dimensions of the form, substantially as and for the purposes set forth.

44. In a press, the combination, with a suitable impression-surface, of a planographic-printing form comprising a curved base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable curved zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

45. In a press, the combination, with a suitable impression-surface, of a planographic-printing form comprising a curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable curved electrodeposited zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

46. In a press, the combination, with a suitable impression-surface, of a printing-form comprising a circumferentially-continuous curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

47. In a press, the combination, with a suitable impression-surface, of a planographic-printing form comprising a circumferentially-continuous curved base of a predetermined

shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable circumferentially-continuous curved electrodeposited printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape and dimensions of the form, substantially as and for the purposes set forth.

48. In a press, the combination, with a suitable impression-surface, of a planographic-printing form comprising a hollow curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

49. In a press, the combination, with a suitable impression-surface, of a planographic-printing form comprising a hollow circumferentially-continuous curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable circumferentially-continuous curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

50. The combination of a suitable interior support and a removable and replaceable hollow printing-form comprising a curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable planographic surface thereon, which surface is substantially integral with the base and is adapted to receive a drawing or transfer of a design and to be thereafter developed into a printing-surface for that design of the character desired, and which surface can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

51. In a press, the combination, with a suitable impression-surface, of a suitable form-support and an exterior removable and replaceable hollow planographic-printing form the printing-form comprising a hollow curved base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the

base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

52. In a press, the combination, with a suitable impression-surface, of a suitable form-support and a removable and replaceable hollow planographic-printing form, the printing-form comprising a hollow circumferentially-continuous curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable circumferentially-continuous curved electrodeposited zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

53. In a printing-press, the combination, with suitable impression mechanism, of a series of printing-forms mounted, in the press, in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising a base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

54. In a printing-press, the combination, with suitable impression mechanism, of a series of planographic-printing forms mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising a base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

55. In a printing-press, the combination, with suitable impression mechanism, of a series of planographic-printing forms mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising a base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable electrodeposited printing-surface thereon which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

56. In a printing-press, the combination, with suitable impression mechanism, of a series of planographic-printing forms mounted in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising a base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, the base being of different material from the printing-surface, substantially as and for the purpose set forth.

57. In a printing-press, the combination, with suitable impression mechanism, of a series of printing-forms mounted in the press in a positive relationship to one another, the printing-forms comprising a curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

58. In a printing-press, the combination, with suitable impression mechanism, of a series of printing-forms mounted in the press in a positive relationship to one another, the printing-forms comprising a circumferentially-continuous curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

59. In a printing-press, the combination, with suitable impression mechanism, of a series of planographic-printing forms mounted in the press in a positive relationship to the impression mechanism and to one another, the printing-forms comprising a circumferentially-continuous curved base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable circumferentially-continuous curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

60. In a printing-press, the combination, with suitable impression mechanism, of a se-

ries of planographic-printing forms mounted in the press in a positive relationship to one another, the printing-forms comprising a circumferentially-continuous cylindrical base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the co-operating parts of the press, the base having a separate removable circumferentially-continuous cylindrical electrodeposited zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimension of the form, substantially as and for the purposes set forth.

61. In a printing-press, the combination, with suitable impression mechanism, of a series of planographic-printing forms mounted in the press in a positive relationship to one another, the printing-forms comprising a curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the coöperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, and mechanism for moving the impression mechanism and the series of printing-forms into and out of contact, substantially as and for the purposes set forth.

62. In a printing-press, the combination, with suitable impression mechanism, and a series of suitable form-supports carrying the printing-forms, of a series of removable and replaceable hollow printing-forms mounted in the press in a positive relationship to one another, the printing-forms comprising a hollow base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the coöperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

63. In a printing-press, the combination, with suitable impression mechanism, and a series of suitable form-supports carrying the printing-forms, of a series of removable and replaceable hollow planographic-printing forms mounted in the press in a positive relationship to one another, the printing-forms comprising a hollow curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the coöperating parts of the press, the base having a separate removable planographic coating or printing surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or

dimensions of the form, substantially as and for the purposes set forth.

64. In a printing-press, the combination, with a suitable impression mechanism, a series of suitable form-supports carrying the printing-forms, of a series of removable and replaceable hollow printing-forms mounted in the press in a positive relationship to one another, the printing-forms comprising a hollow circumferentially-continuous curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the co-operating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

65. In a printing-press, the combination, with a suitable impression mechanism, and a series of suitable form-supports carrying the printing-form, of a series of exterior removable and replaceable hollow planographic-printing forms mounted in the press in a positive relationship to one another, the printing-form comprising a hollow circumferentially-continuous cylindrical base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the coöperating parts of the press, the base having a separate removable circumferentially-continuous cylindrical printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

66. In a printing-press, the combination, with suitable impression mechanism and a series of suitable form-supports carrying the printing-forms, of a series of exterior removable and replaceable hollow printing-forms mounted in the press in a positive relationship to one another, the printing-forms comprising a hollow curved base of predetermined shape and dimensions fixed so as to permanently adapt the form to the coöperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface, is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or dimensions of the form, and mechanism for removing the impression mechanism and the series of printing-forms into and out of contact, substantially as and for the purposes set forth.

67. In a printing-press, the combination, with an impression-drum and a series of form-supports arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of printing-forms removable from and accurately replaceable on

the form-supports, the printing-forms comprising a curved base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

68. In a printing-press, the combination, with an impression-drum and a series of form-supports arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of planographic-printing forms removable from and accurately replaceable on the form-supports, the printing-forms comprising a curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

69. In a printing-press, the combination, with an impression-drum and a series of form-supports arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of planographic-printing forms removable from and accurately replaceable on the form-supports, the printing-forms comprising a circumferentially-continuous curved base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable circumferentially-continuous curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

70. In a printing-press, the combination with an impression-drum and a series of form-cylinders arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of hollow composite cylindrical printing-forms removable from the form-cylinders and accurately replaceable thereon, the printing-forms comprising a hollow cylindrical strengthening-base of predetermined shape and dimensions, fixed so as to permanently adapt the forms to the cooperating parts of the press, and an exterior separate removable printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially

affecting the dimensions of the printing-form, substantially as and for the purposes set forth.

71. In a printing-press, the combination with an impression-drum and a series of form-cylinders arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of hollow composite cylindrical planographic-printing forms removable from the form-cylinders and accurately replaceable thereon, the printing-forms comprising a hollow cylindrical strengthening-base of predetermined shape and dimensions, fixed so as to permanently adapt the forms to the cooperating parts of the press and an exterior separate removable zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the dimensions of the printing-form, substantially as and for the purposes set forth.

72. In a printing-press, the combination, with an impression-drum and a series of form-cylinders arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of hollow composite cylindrical planographic-printing forms removable from the form-cylinders and accurately replaceable thereon, the printing-forms comprising a hollow cylindrical strengthening-base of predetermined shape and dimensions, fixed so as to permanently adapt the forms to the cooperating parts of the press, and an exterior separate removable electrodeposited printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the dimensions of the printing-form, substantially as and for the purpose set forth.

73. In a printing-press, the combination with an impression-drum and a series of form-cylinders arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of hollow composite cylindrical planographic-printing forms removable from the form-cylinders and accurately replaceable thereon, the printing-forms comprising a hollow cylindrical strengthening-base of predetermined shape and dimensions, fixed so as to permanently adapt the forms to the cooperating parts of the press, and an exterior separate removable electrodeposited zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the dimensions of the printing-form, substantially as and for the purposes set forth.

74. In a printing-press, the combination with an impression-drum and a series of form-cylinders arranged on the impression-face of

the drum removable from and accurately replaceable in the press and carrying the printing-forms, of a series of hollow composite cylindrical planographic-printing forms removable from the form-cylinders and accurately replaceable thereon, the printing-forms comprising a hollow cylindrical strengthening-base of predetermined shape and dimensions, fixed so as to permanently adapt the form to the cooperating parts of the press, and an exterior separate removable electrodeposited zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the dimensions of the printing-form, the base being of different material from the printing-surface, substantially as and for the purposes set forth.

75. In a lithographic-printing press, the combination, with suitable impression mechanism and a series of suitable inking and dampening mechanism, of a series of lithographic-printing forms mounted in the press in a positive relationship to the impression surface or surfaces and to one another, the printing-forms comprising a curved base of predetermined shape and dimensions fixed so as to permanently adapt the forms to the cooperating parts of the press, the base having a separate removable curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and then renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

76. In a lithographic-printing press, the combination, with suitable impression mechanism and a series of suitable inking and dampening mechanism, and a series of suitable form-supports carrying the printing-forms, of a series of removable and replaceable hollow lithographic-printing forms mounted in the press in a positive relationship to one another, the printing-forms comprising a hollow curved base of predetermined shape and dimensions fixed so as to permanently adapt the forms to the cooperating parts of the press, the base having a separate removable curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

77. In a lithographic-printing press, the combination, with suitable impression mechanisms and a series of suitable inking and dampening mechanisms, and a series of suitable

able form-supports carrying the printing-forms, of a series of exterior removable and replaceable hollow composite lithographic-printing forms, the printing-forms comprising a hollow strengthening-base of predetermined shape and dimensions fixed so as to permanently adapt the forms to the cooperating parts of the press and having a separate removable printing-surface thereon, which printing-surface is substantially integral with the base, substantially as and for the purposes set forth.

78. In a lithographic-printing press, the combination, with an impression-drum and a series of suitable inking and dampening mechanisms and a series of form-supports arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of lithographic-printing forms removable from and accurately replaceable on the form-supports, the printing-forms comprising a curved base of predetermined shape and dimensions fixed so as to permanently adapt the form to the cooperating parts of the press, the base having a separate removable curved printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the shape or dimensions of the form, substantially as and for the purposes set forth.

79. In a lithographic-printing press, the combination, with an impression-drum and a series of suitable inking and dampening mechanisms and a series of form-cylinders arranged on the impression-face of the drum and removable from and accurately replaceable in the press and carrying the printing-forms, of a series of hollow composite cylindrical lithographic-printing forms removable from the form-cylinders and accurately replaceable thereon, the printing-forms comprising a hollow cylindrical strengthening-base of predetermined shape and dimensions, fixed so as to permanently adapt the forms to the cooperating parts of the press, and an exterior separate removable electrodeposited zinc printing-surface thereon, which printing-surface is substantially integral with the base and can be removed from and renewed on the base without substantially affecting the dimensions of the printing-form, substantially as and for the purposes set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

EDWARD HETT.

Witnesses:

FRANK D. BLACKISTONE,
NICHOLAS M. GOODLETT, Jr.