

No. 662,855.

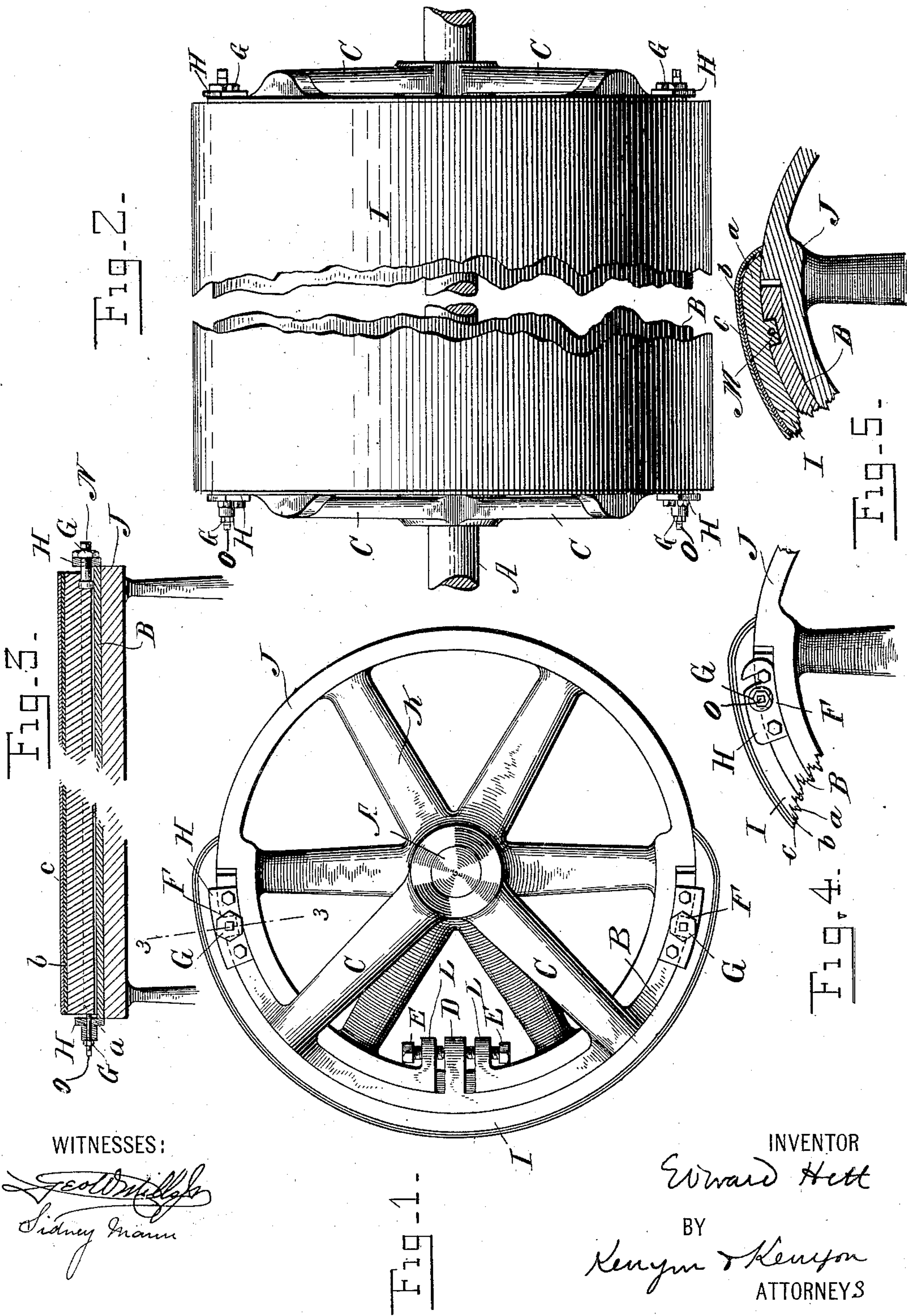
Patented Nov. 27, 1900.

E. HETT.
PRINTING PRESS.

(Application filed Mar. 6, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

Geoffrey H. Hett
Sidney Mann

INVENTOR

Edward Hett

BY

Kenyon & Kenyon
ATTORNEYS

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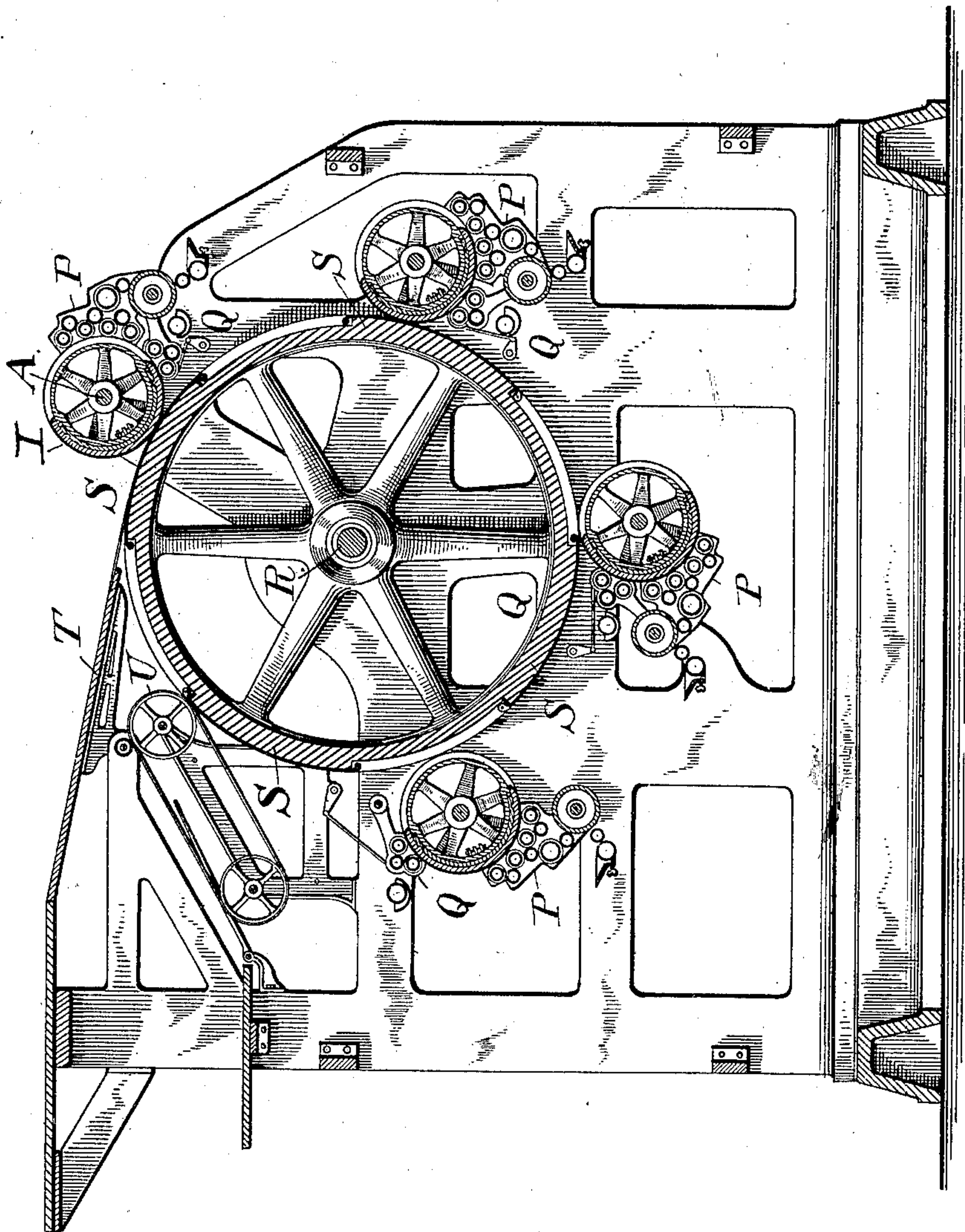
E. HETT.
PRINTING PRESS.

(Application filed Mar. 6, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig-5-



WITNESSES:

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UNITED STATES PATENT OFFICE

EDWARD HETT, OF NEW YORK, N. Y.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 662,855, dated November 27, 1900.

Application filed March 6, 1899. Serial No. 707,923. (No model.)

To all whom it may concern:

Be it known that I, EDWARD HETT, a citizen of the United States, and a resident of New York, (New Dorp,) in the county of Richmond, State of New York, have invented certain new and useful Improvements in Printing-Presses, of which the following is a specification.

My invention relates to printing-presses, and particularly to multicolor-printing presses and to multicolor-printing upon sheets, and it relates also to such printing with planographic printing-surfaces, and it has more particular reference to the printing-surfaces employed in such presses and their combinations.

It has for its objects to apply the rotary-press principle and the curved printing-surfaces involved therein to the case of printing upon separate sheets of paper and generally to improve and cheapen that class of printing.

The invention consists in the novel features, constructions, and combinations of parts herein shown and described.

The accompanying drawings, which form a part hereof, represent a printing-press and a printing-plate embodying my invention in its preferred form.

Figure 1 is a side elevation of the rotary printing device. Fig. 2 is a front elevation of the same with some of the parts broken away. Fig. 3 is a cross-section on the line 3 3 of Fig. 1. Fig. 4 is a detail view showing the device for adjusting and locking the printing-form upon the form-support at one end thereof. Fig. 5 is a detail and sectional view showing part of the means for combining the printing-form with its form-support. Fig. 6 is a diagrammatic sketch of a planographic printing-press for printing on the sheet, showing the preferred method of combination of a series of the printing-forms in a press.

Like letters of reference in the several figures indicate like parts.

A is the shaft with which the printing-form rotates in the operation of printing.

J is a roller which is carried by the spokes K, projecting from a hub which is keyed to the shaft A, so as to move with it.

B is a portion of a hollow cylinder or roller, less than the whole circumference, (in the drawings it is shown as one-half of this cir-

cumference,) which is carried by spokes C, projecting from a hub which is loosely mounted on the shaft A. This sectional roller B, or "section of a roller," as it may be called, is a snug fit for that part of the circumference of the roller J which it incloses. It is adjustable circumferentially on the roller J within the necessary limits. That adjustment is attained by means of an inwardly-projecting lug D on the sectional roller B, which moves between two lugs L L on the roller J. Its position between the two lugs L L is determined by the adjustment of the screws E E. By this means the circumferential position of the sectional roller B upon the roller J may be adjusted within the required limits and in that way the circumferential position with reference to the shaft A of the printing-form which is carried on said sectional roller B.

The parts thus far described constitute the interior form-support of my invention.

I is the exterior curved printing-form. It is fitted interiorly to be supported by the sectional roller B, and it has two radially-depending or inwardly-projecting lugs M, which extend from side to side of the printing-form, one near one end and one near the other end. The sectional roller B has slots F, which exactly correspond to and accurately fit the lugs M, as is clearly shown in Fig. 5. These lugs, with their corresponding slots F, may be more in number, if desired. The printing-form is readily applicable to and removable from the form-support. It is applied by sliding it onto the sectional roller B from one end of the roller, the lugs M sliding in their corresponding slots F. The printing-form is adjusted and held in position longitudinally of the roller in the following manner: The side pieces H H after the printing-form is in place are screwed fast to the sides of the sectional roller B. At one end of the roller and passing through a threaded hole in said plate H is an adjusting and starting screw-bolt N, which has an enlarged head within the depending lug of the printing-form, as shown in Fig. 3. By turning the screw-bolt N the printing-form can be moved back and forth on the sectional roller B, the lugs M sliding in the slots F. This device may be used to start the printing-form on its support when it is desired to remove it. It

may also be used to secure those fine longitudinal adjustments of the printing-form on its support that may be desirable. To turn the screw-bolt N in one direction moves the printing-form in one direction on the sectional roller B, and to screw the screw-bolt in the other direction moves the printing form in the other direction on the sectional roller B. G is a jam-nut to lock the screw-bolt N in any position to which it may have been adjusted. At the other side of the printing-form is an adjustable stop, being a screw-bolt O, carried in a screw-threaded hole in the side pieces H at that side of the roller B. This screw-bolt O may be screwed in more or less and takes against the printing-form or some part of it. It thus coöperates with the screw-bolt N in adjusting and holding the printing-form longitudinally on the form-support. The screw-bolt O may have a jam-nut G, if desired. The circumferential adjustment of the printing-form is attained, as heretofore described, by means of the screw-bolts E E.

I is the exterior curved printing-form. It is circumferentially discontinuous—that is to say, its outer or printing surface does not form a complete circle or ellipse or any other complete curved form, but extends through a part only of the complete outline of such a curved figure. In the drawings it is represented as continuous throughout merely a semicircle of circumferential length and is discontinuous throughout the second semicircle required to make a complete circle. It might of course extend through a greater or a less proportion of the complete circle or other curved figure of which its surface forms a part. This printing-form I is in itself a rigid and inflexible printing-form, maintaining the substantial integrity of its shape when off as well as when on its support. It is curved exteriorly, and this curved exterior surface is circumferentially discontinuous and is primarily—that is to say, before it receives its design—a planographic surface. It is constructed interiorly to fit the form-support and is removable therefrom and replaceable thereon, and it is primarily constructed exteriorly to fit the coöperating parts of the press and of exterior planographic surface suitable to receive a design, as by the lithographic process of transferring, and to be thereafter developed by etching or in any other suitable manner into a printing-surface for that design of the character desired, as by light etching into a planographic printing-surface or by deep etching, routing out, &c., into a relief printing-surface, or otherwise. The printing-form is preferably composite in its construction, consisting of an inner inflexible curved base adapted to fit the interior support, as described, and an exterior printing-surface of different material formed on or applied to the curved base and integral therewith. In the drawings I have represented this printing-form in the way in which I prefer to build it—namely, with a thick substantial and so in-

flexible base *a* of aluminium, faced exteriorly with a thin layer of copper *b* and a thin printing-surface of zinc *c*. Aluminium is preferred for the main body of the base by reason of its lightness, though other materials might be employed—as, for example, copper. I prefer for the printing-surface electrolytically-deposited zinc both for planographic printing-surfaces and for relief or intaglio printing-surfaces. I prefer, if the base is largely of aluminium, to face it with a thin layer of copper in order to facilitate the electrodeposition of the zinc for the printing-surface and to improve the character of that surface and also to permit of the ready removal of the zinc printing-surface, as by acids, after the printing of a given design is completed, without removing the base or any part of it. Nitric acid, for instance, may be so used as to readily and quickly and wholly remove the zinc without practically affecting the copper.

This thin layer of copper may be applied to the aluminium electrolytically, and I prefer to so apply it. For the purposes of my broad invention other materials than zinc may be used for the printing-surface; but the printing-surface must be curved and inflexible, and when composite its parts must be integral one with another, and other materials may be used for the base than those mentioned; but preferably the material is different from that which constitutes the exterior printing-surface in order that the latter may be the more capable of ready removal from the base and ready renewal thereon. Ready removal may be accomplished, for instance, by the use of an acid which attacks the material of the printing-surface, but does not substantially attack the material of the base, or the printing-surface may be removed mechanically, as in a lathe. While I prefer to apply the printing-surface by electrolytical deposition on the base, still it may be applied in other ways—for instance, by casting—so long as it constitutes with the base an integral and an inflexible structure. By the combination of base and printing-surface described the base may be once for all painstakingly made to the exact dimensions required and perfectly fitting its intended support, and may thereafter be used an indefinite number of times, reliably and accurately fitting into its supporting parts in the press, but having as its printing-surface a new and fresh printing-surface for each new printing job, whereby the cost of such printing-forms is greatly reduced and their character perfected and the character and accuracy of work that they will achieve are greatly improved. Curved typographic printing-surfaces have heretofore been cast, the entire printing-form of one material and in one solid piece, the design being produced in the casting process, the whole having the inevitable imperfections of fit, register, &c., which characterize cast metal, which changes its temperature after receiving its permanent form, and flexible print-

ing-surfaces have been bent from a straight or flat form around curved supports and fastened and used in such bent position. Many difficulties and inconveniences and inaccuracies, however, attend both these methods, and my improved curved circumferentially-discontinuous printing-form is an improvement in every way upon them, the design being placed upon my printing-form after the form has passed through those mechanical processes necessary to make it mathematically and permanently accurate in dimensions. It is a matter of the greatest importance that the printing-surface should be smooth and even and the printing parts of absolutely uniform height without fold, wrinkle, holes, or inequalities of any kind, and these advantages my improved inflexible printing-form possesses in a marked degree. These qualities are of peculiar importance in planographic or lithographic printing, and also in relief-plate printing where the relief-plates are obtained by the deep etching or otherwise of an original planographic surface, which are the two branches of the art to which my invention is especially applicable. Where my exterior printing-surface is applied by electrical deposition to the curved interior base, the resulting printing-form, as a whole, owes its exact shape and dimensions and perfection of form, &c., to the previous accurate shaping and forming of the solid and inflexible base, provision being made in the shape of said base for the exact thickness of the uniform exterior printing-surface that is to be applied. When this exterior printing-surface is applied by casting, the resulting printing-form as a whole in the same way may owe its exact shape and dimensions to the accurately-prepared base, upon the exterior surface of which the casting is made and in the shaping of which provision is made for the exact thickness of casting that is to be made upon it, or the exterior surface after casting would be trued up, if found necessary, and made to accurately fit the cooperating parts of the press, and its surface would be made suitable, if not already so, to receive a design, and when in this condition and all mechanical work completed and the curved form permanently shaped for use interiorly and exteriorly it would receive its design by the lithographic process and be developed into a printing-surface for that design of the character desired. When the whole printing-form is cast in one piece of zinc or aluminium or other material, the form when thoroughly cool and when it has assumed its permanent shape would be trued up interiorly and exteriorly to fit the supporting and cooperating parts of the press and its surface suitably finished or prepared, and the design would then be transferred to it and the surface thereupon developed into a printing-surface for that design of the character desired. Where the printing-form is composite, the process of applying the surface to the base

should be so conducted as to make the union between the exterior printing-surface and the inner inflexible base a firm and secure union, so that the two become substantially integral in operation. I prefer, however, in this connection the method of application by electrolytical deposition. After the printing-forms have been properly constructed, as described, they will before use in the printing-press receive in the shape of a suitable transfer the design that they are to print. This design may be transferred to the printing-surfaces in any desired way. Preferably this should be done in a transfer-press which is provided with supporting devices similar to the interior form-support heretofore described. In this way the transfer can be accurately made to the printing-surface with reference to its subsequent accurate printing in the printing-press. After the design is transferred to it it may be developed by suitable etching into a planographic printing-surface, or by deep etching, supplemented by the use of a routing-out machine, if desired, it may be developed into a relief printing-surface. In the latter case the printing-surface, if the form is composite, should be slightly thicker than is necessary in the former case, although in each case the printing-surface may be thin in comparison with the relatively thick and inflexible base. I prefer to prepare a series of printing-surfaces such as described and to transfer to them a series of registering designs accurately and with reference to one another in the manner, for instance, set out in my application for patent, Serial No. 703,082, filed January 23, 1899, and in application, Serial No. 695,281, filed November 2, 1898, and then to mount them in a suitable press—as, for instance, in such a press as is shown diagrammatically in Fig. 6 of the drawings—and then to print in approximately instantaneous succession from them.

Referring in detail to Fig. 6, I represent a series of curved composite printing-forms mounted upon their interior form-supports, as heretofore described. They are represented in Fig. 6 as planographic printing-surfaces, printing a four-color job. Each printing-surface has a suitable inking mechanism P and a suitable dampening mechanism Q. The details of these mechanisms form no part of the present invention, and therefore they need not be further described. There is an impression-drum on shaft R, suitably driven and by any suitable mechanism positively driving the four printing-surfaces with it. Its surface consists of a series of discontinuous impression-surfaces S. These impression-surfaces correspond in circumferential length with the circumferential length of the printing-forms I, and the distances between these discontinuous impression-surfaces in the face of the drum correspond to the circumferential distance between the ends of the printing-forms I. The printing-forms are arranged on the impression-face of the drum as shown, and

they rotate positively with the drum. The paper is fed to the machine in the form of sheets from the table T, either by hand or automatically, as desired. The intervals
 5 caused by the discontinuous character of the printing and impression surfaces give time for the feeding of the sheets. Suitable grippers may be used to hold the sheets on the impression-surface. Such devices having
 10 nothing to do with the present invention are not shown in the drawings and need not be further mentioned. They should be effectual, however, to hold the sheets from slipping upon the impression-surface, so that proper
 15 register may be obtained. The several printing-forms are suitably arranged with reference to one another to attain this register in the printing and are suitably arranged with reference to the impression-surfaces to reli-
 20 ably and accurately do the printing required of them. The apparatus for attaining these several adjustments forms no part of the present invention and need not be here described. At U is shown apparatus for delivering fin-
 25 ished sheets from the drum. Any suitable apparatus will answer the purpose.

Where the printing is done upon the web and the designs are of such a nature as to call for continuous printing on the web, I have
 30 employed curved printing-surfaces that are circumferentially continuous, and important advantages result from that construction, not only in economy of printing, but also in solidity of construction, combined with rela-
 35 tive lightness and thinness of parts. In the present invention, however, where it is designed to print intermittently and preferably upon sheets giving intervals of time between each sheet and the next within which to prop-
 40 erly handle the sheets for feeding and gripping purposes, it is not necessary or desirable to employ circumferentially-continuous printing-surfaces. My invention avoids their use, but combines many of the advantages of such
 45 circumferentially-continuous printing-surfaces with the discontinuous character of printing-surface suitable for the purpose in view. The interior form-support of my inven-
 50 tion preferably possesses the strength and rigidity of a circumferentially-continuous construction, although that is not absolutely essential provided the support is strong enough without it; but my improved printing-form by
 55 its substantial and rigid construction and by its combination with an interior form-support attains the advantages of strength and accuracy of printing which characterize circumfer-
 60 entially-continuous tubular printing-surfaces, and my invention makes available for intermittent printing, such as upon sheets, the rotary-press principle, which is the cheapest and most perfect form of printing known, and by it also intermittent multicolor-printing on the rotary-press principle is also made prac-
 65 ticable.

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

1. In a lithographic press, the combination with a form-supporting device, of a curved circumferentially-discontinuous inflexible
 70 hollow shell-like removable and replaceable printing-form having an outer surface adapted to receive a lithographic drawing or transfer, the printing-form being of shape and dimensions permanently fixed so as to perma-
 75 nently adapt the form to the coöperating parts of the press, substantially as described.

2. In a lithographic press, the combination with a suitable impression surface or sur-
 80 faces, and suitable inking and dampening mechanisms, of a series of form-supporting devices and a series of curved circumferentially-discontinuous inflexible hollow shell-like removable and replaceable printing-forms hav-
 85 ing outer surfaces adapted to receive a lithographic drawing or transfer, the printing-forms being of shape and dimensions permanently fixed so as to permanently adapt the forms to the coöperating parts of the press, substantially as described.
 90

3. In a lithographic press, the combination of a form-supporting device adapted to be placed in position in a press, and a series of inflexible removable and replaceable curved circumferentially-discontinuous hollow shell-
 95 like printing-forms having outer surfaces adapted to receive a lithographic drawing or transfer, the printing-forms being each of exactly the same shape and dimensions as the others so as to occupy, when placed upon the
 100 supporting device, exactly the same position and space in the press as any one of the others when thus placed, substantially as described.

4. In a lithographic press, the combination
 105 of a series of form-supporting devices each having a preëstablished seat for printing-forms which occupies the same position upon the support and is of the same shape and dimensions as those of the other form-supports,
 110 and a series of inflexible removable and replaceable curved circumferentially-discontinuous hollow shell-like printing-forms having outer surfaces adapted to receive a lithographic drawing or transfer, the printing-
 115 forms being each of exactly the same shape and dimensions as the others so as to be interchangeable one with another, so that each, when placed upon a supporting device, will occupy exactly the same position and space
 120 in the press as any of the others would occupy if placed upon the said supporting device, substantially as described.

5. In a lithographic press, the combination,
 125 with a suitable impression surface or surfaces, and suitable inking and dampening mechanisms, of a series of form-supporting devices and a series of curved circumferentially-discontinuous inflexible hollow shell-like removable and replaceable printing-
 130 forms having outer surfaces adapted to receive a lithographic drawing or transfer, the printing-forms being of shape and dimensions permanently fixed so as to permanently adapt

the forms to the cooperating parts of the press, and guiding means with reference to which the positions of the forms upon the supports are fixed both longitudinally and circumferentially, substantially as described.

6. In a lithographic press, the combination with a form-supporting device, of a curved circumferentially - discontinuous inflexible hollow shell-like removable and replaceable composite printing-form having an outer surface of suitable lithographic material adapted to receive a lithographic drawing or transfer, and an inner strengthening-shell, substantially as described.

7. In a lithographic press, the combination with a form-supporting device, of a curved circumferentially - discontinuous inflexible hollow shell-like removable and replaceable composite printing-form having an outer electrodeposited surface adapted to receive a lithographic drawing or transfer, and an inner strengthening-shell the printing-form being of shape and dimensions permanently fixed so as to permanently adapt the form to the cooperating parts of the press, substantially as described.

8. A printing-form comprising a curved base of predetermined shape and dimensions, the base having a separate circumferentially-discontinuous 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, the printing-form being of shape and dimensions permanently fixed so as to permanently adapt the form to the cooperating parts of the press, substantially as described.

9. A printing-form comprising a circumferentially-discontinuous curved base of predetermined shape and dimensions, the base having a separate circumferentially-discontinuous 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, substantially as described.

10. A printing-form comprising a circumferentially-discontinuous curved base of predetermined shape and dimensions, the base having a separate circumferentially-discontinuous 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, 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, substantially as described.

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

series of printing-forms and means for supporting them in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising each a circumferentially-discontinuous curved base of predetermined shape and dimensions, the base having a separate circumferentially - discontinuous 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, substantially as described.

12. A printing-form comprising a circumferentially-discontinuous curved base of predetermined shape and dimensions, the base having a separate circumferentially-discontinuous 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, substantially as described.

13. A printing-form comprising a circumferentially-discontinuous curved base of predetermined shape and dimensions, the base having a separate circumferentially-discontinuous 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, substantially as described.

14. A printing-form comprising a circumferentially-discontinuous curved base of predetermined shape and dimensions, the base having a separate circumferentially-discontinuous 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, 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, substantially as described.

15. In a printing-press, the combination with a suitable impression mechanism of a series of printing-forms and means for supporting them in the press in a cooperating relationship to the impression mechanism and to one another, the printing-forms comprising each a circumferentially - discontinuous curved base of predetermined shape and dimensions, the base having a separate circumferentially - discontinuous 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, substantially as described.

16. A printing-form comprising a circumferentially-discontinuous curved 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, substantially as described.

17. A printing-form comprising a circumferentially-discontinuous curved 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, substantially as described.

18. A printing-form comprising a circumferentially-discontinuous curved base, of predetermined shape and dimensions, the base having a thin electrodeposited zinc 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, substantially as described.

19. A printing-form comprising a curved circumferentially-discontinuous 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.

20. 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 circumferentially-discontinuous 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.

21. 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 circumferentially-discontinuous 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.

22. 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 each 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 curved circumferentially-discontinuous 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.

23. In a printing-press, the combination, with an impression-drum having a series of impression-surfaces adapted to carry sheets of paper, of a series of printing-forms mounted in the press, in a cooperating relationship to the impression-drum and to one another, the printing-forms comprising each 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 curved circumferentially-discontinuous 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.

24. In a lithographic printing-press, the combination, with an impression-drum having a series of impression-surfaces adapted to carry sheets of paper, and a series of suitable inking and dampening mechanisms, 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 each 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 circumferentially-discontinuous 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.

25. The combination with an interior form-support, of an exterior curved circumferentially-discontinuous inflexible printing-form constructed interiorly to fit the support and removable therefrom and of exterior electro-

lytically-deposited planographic zinc surface suitable to receive a design as by the lithographic process of transferring and to be thereafter developed by etching or in other
5 suitable manner into a printing-surface for that design of the character desired, the printing-form being composite and consisting of an inner strengthening-base faced exteriorly with copper and an outer printing-surface of
10 electrolytically-deposited zinc.

26. The combination with an interior form-support, of an exterior curved circumferentially-discontinuous inflexible printing-form constructed interiorly to fit the support and
15 removable therefrom and of exterior electrolytically-deposited planographic zinc surface suitable to receive a design as by the lithographic process of transferring and to be thereafter developed by etching or in other
20 suitable manner into a printing-surface for that design of the character desired, the printing-form being composite and consisting of an inner strengthening-base of aluminium faced exteriorly with copper and an outer
25 printing-surface of electrolytically-deposited zinc.

27. In a printing-press, the combination with an interior form-support, of an exterior curved circumferentially-discontinuous inflexible printing-form applicable to and removable from the support, the printing-form
30 being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with copper and permanently adapted to fit the interior support and a printing-surface of different material formed on or applied to the curved base and integral therewith, substantially as described.

28. In a printing-press, the combination
40 with an interior form-support, of an exterior curved circumferentially-discontinuous inflexible printing-form applicable to and removable from the support, the printing-form being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with copper and permanently adapted to fit the interior support and a zinc surface
45 formed on or applied to the curved base and integral therewith, substantially as described.

29. In a printing-press, the combination
50 with an interior form-support, of an exterior curved circumferentially-discontinuous inflexible printing-form applicable to and removable from the support, the printing-form being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with copper and permanently adapted to fit the interior support and a zinc printing-surface electrolytically deposited on the
55 curved base and integral therewith, substantially as described.

30. In a printing-press, the combination
60 with an interior form-support, of an exterior curved circumferentially-discontinuous inflexible printing-form applicable to and removable from the support, the printing-form

being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with electrolytically-deposited copper and permanently adapted to fit the interior
70 support and a printing-surface of different material formed on or applied to the curved base and integral therewith, substantially as described.

31. In a printing-press, the combination
75 with an interior form-support, of an exterior curved circumferentially-discontinuous inflexible printing-form applicable to and removable from the support, the printing-form being composite and consisting of an inner inflexible base of aluminium faced exteriorly with electrolytically deposited copper and permanently adapted to fit the interior support and a zinc surface formed on or applied to the curved base and integral therewith, substantially
80 as described.

32. In a printing-press, the combination with an interior form-support, of an exterior curved circumferentially-discontinuous inflexible printing-form applicable to and removable from the support, the printing-form
85 being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with electrolytically-deposited copper and permanently adapted to fit the interior support and a zinc printing-surface electrolytically deposited on the curved base and integral therewith, substantially as described.

33. In a planographic printing-press, the combination with an interior form-support,
90 of an exterior curved circumferentially-discontinuous inflexible printing-form applicable to and removable from the support, the printing-form being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with copper and permanently adapted to fit the interior support and a thin planographic zinc printing-surface electrolytically deposited on the curved base and integral therewith, substantially as described.

34. In a planographic printing-press, the combination with an interior form-support,
95 of an exterior curved circumferentially-discontinuous inflexible printing-form applicable to and removable from the support, the printing-form being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with electrolytically-deposited copper and permanently adapted to fit the interior support and a thin planographic zinc printing-surface electrolytically deposited on the curved base and integral therewith, substantially as described.

35. In a printing-press, the combination
100 with a suitable impression-surface and a series of inking mechanisms, of a series of interior form-supports and a series of exterior curved circumferentially-discontinuous inflexible printing-forms, each form applicable
105 to and removable from its support and adjustable longitudinally and circumferen-

tially, the printing-forms being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with copper and permanently adapted to fit the interior support, and a zinc printing-surface electrolytically deposited on the curved base and integral therewith, substantially as described.

36. In a printing-press, the combination with an impression-drum having a series of discontinuous impression-surfaces and with a series of inking mechanisms, of a series of interior form-supports and a series of exterior curved circumferentially-discontinuous inflexible printing-forms, each form applicable to and removable from its support and adjustable longitudinally and circumferentially, the printing-forms being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with copper and permanently adapted to fit the interior support, and a zinc printing-surface electrolytically deposited on the curved base and integral therewith, the printing-forms being arranged on the impression-face of the drum and rotating positively therewith, substantially as described.

37. In a planographic printing-press, the combination with a suitable impression-surface and a series of inking and dampening mechanisms, of a series of interior form-supports and a series of exterior curved circumferentially-discontinuous inflexible printing-forms, each form applicable to and removable from its support and adjustable longitudinally and circumferentially, the printing-forms being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with copper and permanently adapted to fit the interior support, and a thin planographic zinc printing-surface electro-

lytically deposited on the curved base and integral therewith, substantially as described.

38. In a planographic printing-press, the combination with an impression-drum having a series of discontinuous impression-surfaces and with a series of inking and dampening mechanisms, of a series of interior form-supports and a series of exterior curved circumferentially-discontinuous inflexible printing-forms, each form applicable to and removable from its support and adjustable longitudinally and circumferentially, the printing-forms being composite and consisting of an inner inflexible curved base of aluminium faced exteriorly with copper and permanently adapted to fit the interior support, and a thin planographic zinc printing-surface electrolytically deposited on the curved base and integral therewith, the printing-form being arranged on the impression-face of the drum and rotating positively therewith, substantially as described.

39. In a printing-press, the combination with a two-part interior form-supporting roller having a full roller J fixed to the shaft and a sectional roller B loose on the shaft but adapted to be adjusted circumferentially on the roller J and to be held fixed in such adjustment, of an exterior curved circumferentially-discontinuous printing-form, applicable to and removable from the sectional roller B of the support and adjustable longitudinally on the sectional roller B, substantially as described.

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

EDWARD HETT.

Witnesses:

GEO. W. MILLS, Jr.,
EDWIN SEGER.