

No. 637,559

Patented Nov. 21, 1899.

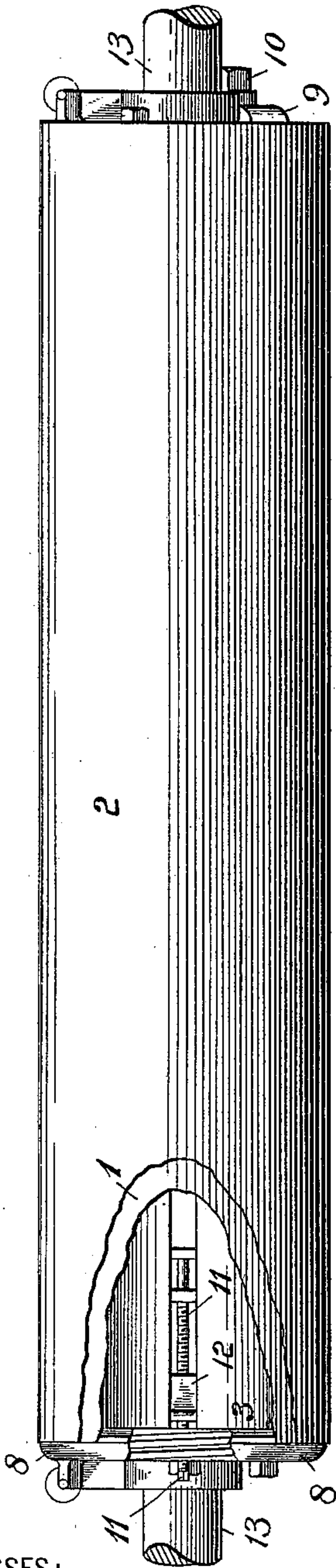
E. HETT.
MULTICOLOR PRINTING.

(Application filed Nov. 1, 1899.)

(No Model.)

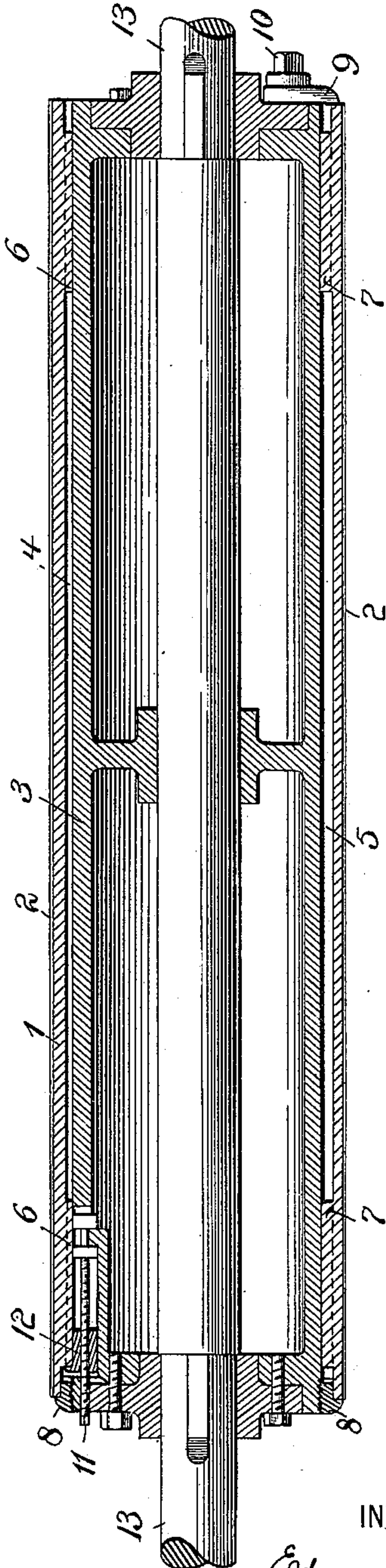
6 Sheets—Sheet 1.

Fig-1-



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Fig-2-



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Fig. 5-

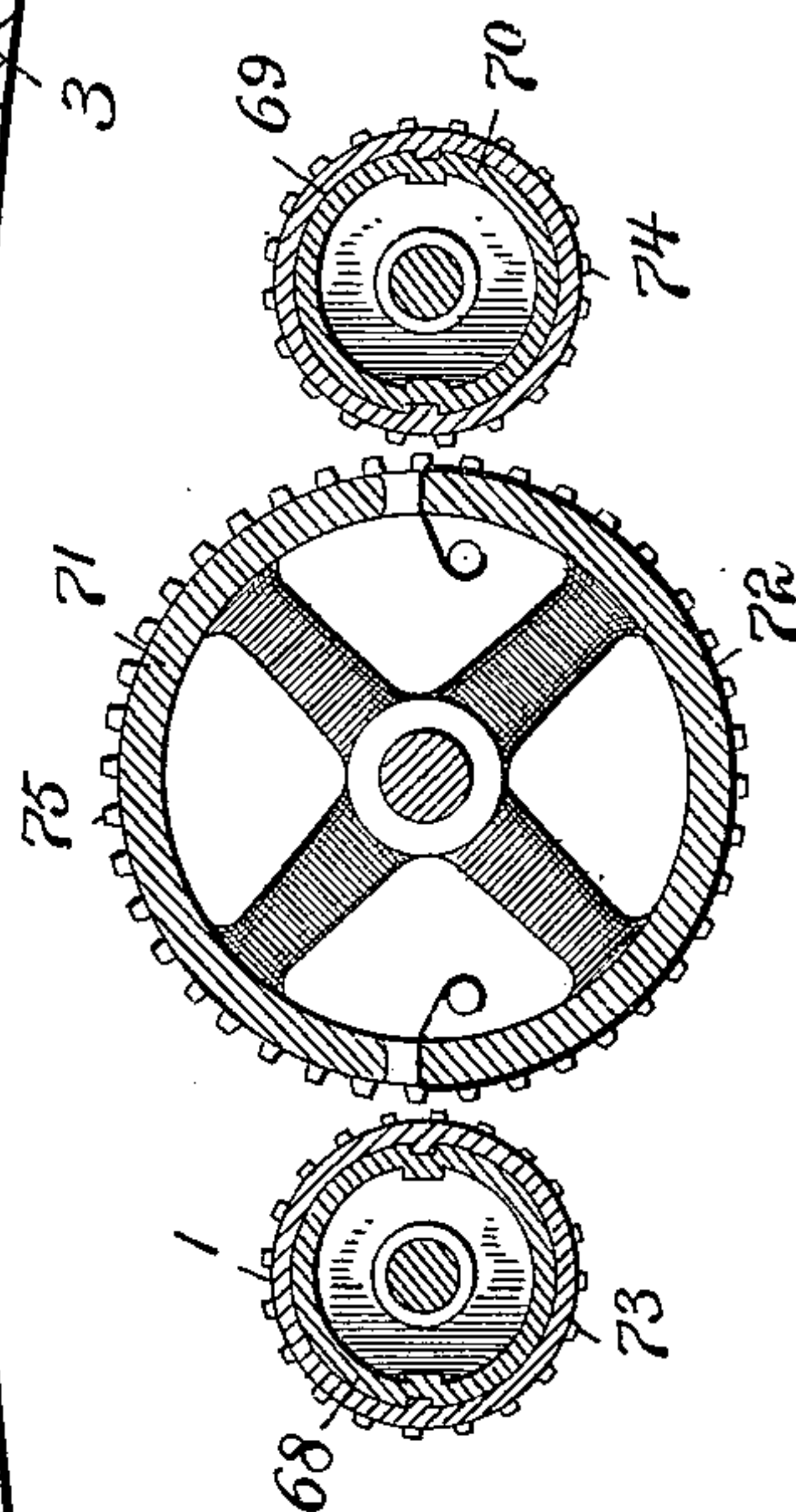
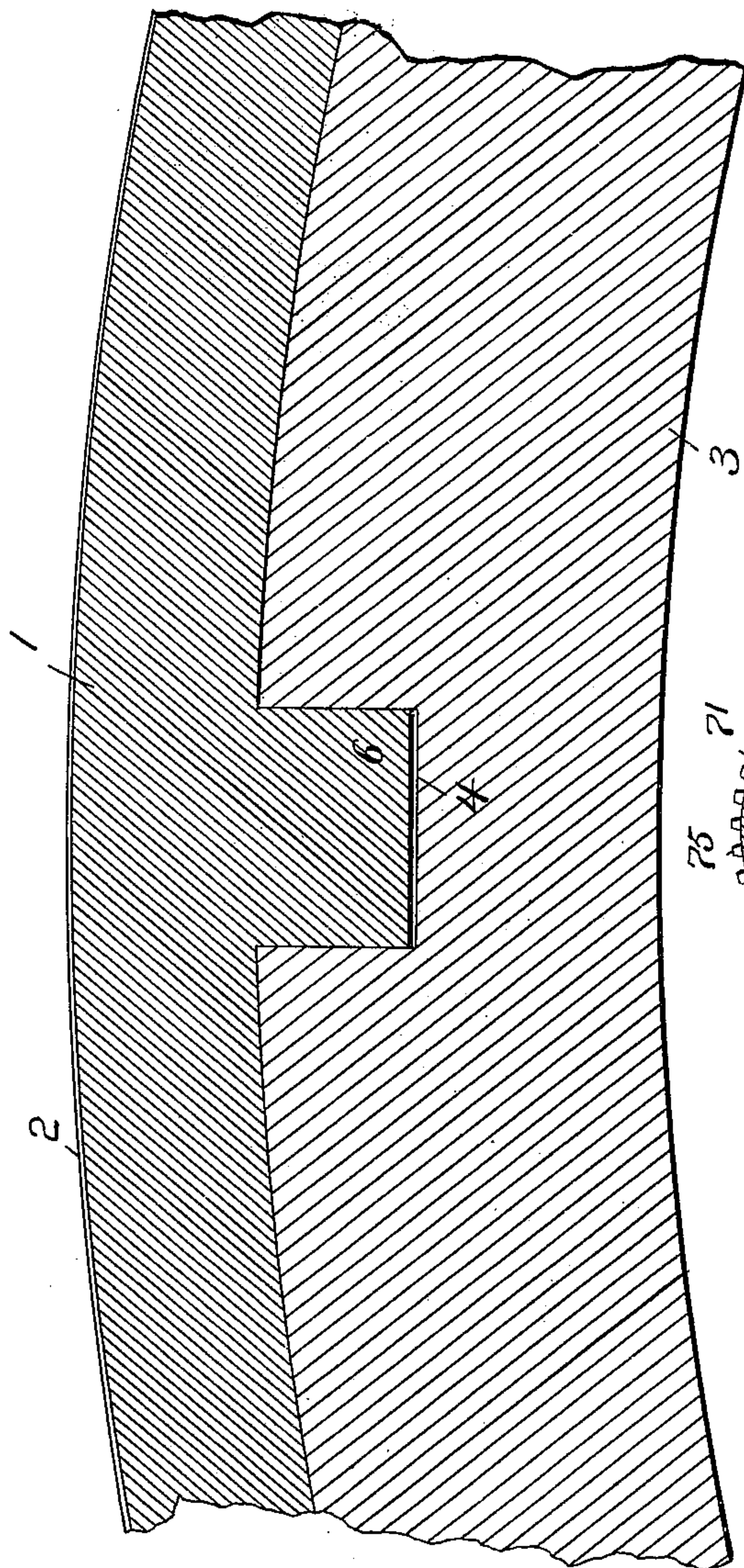


Fig. 7-

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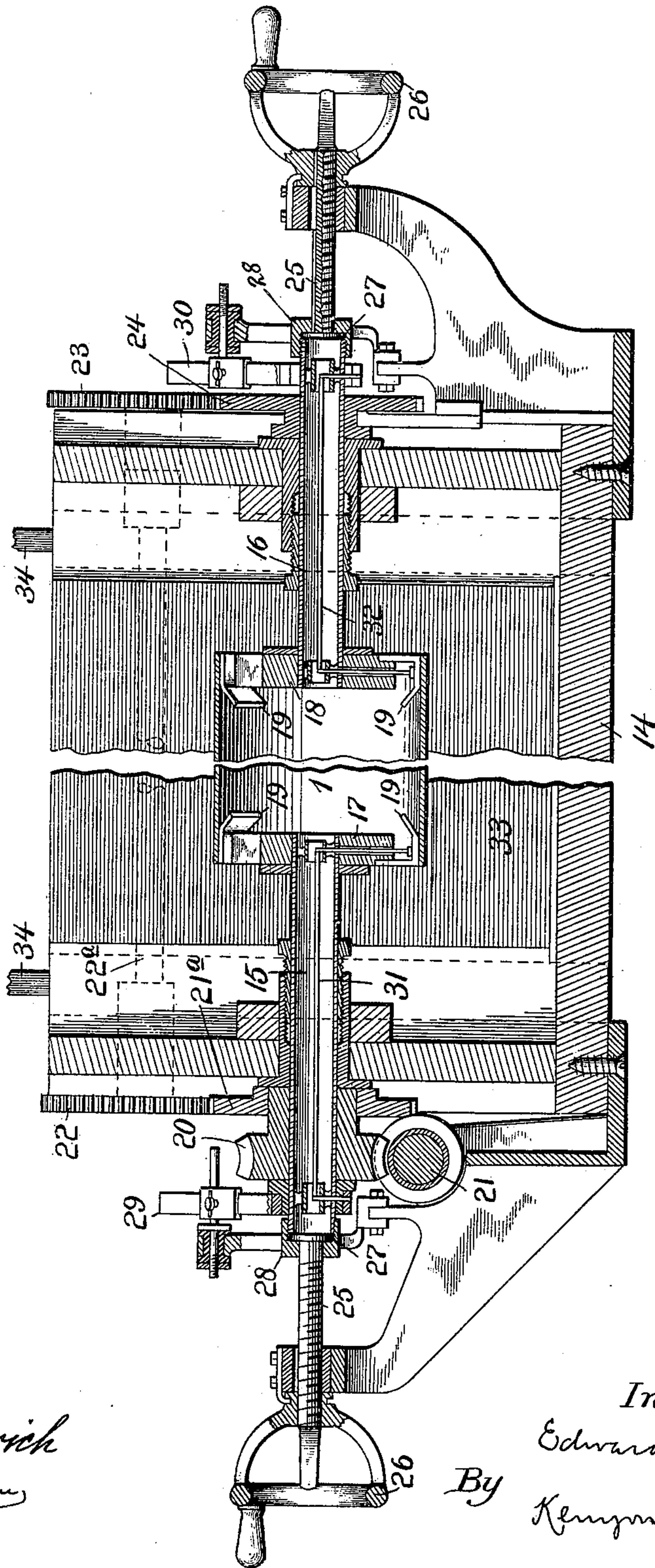
E. HETT.
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6 Sheets—Sheet 3.

Fig. 4.



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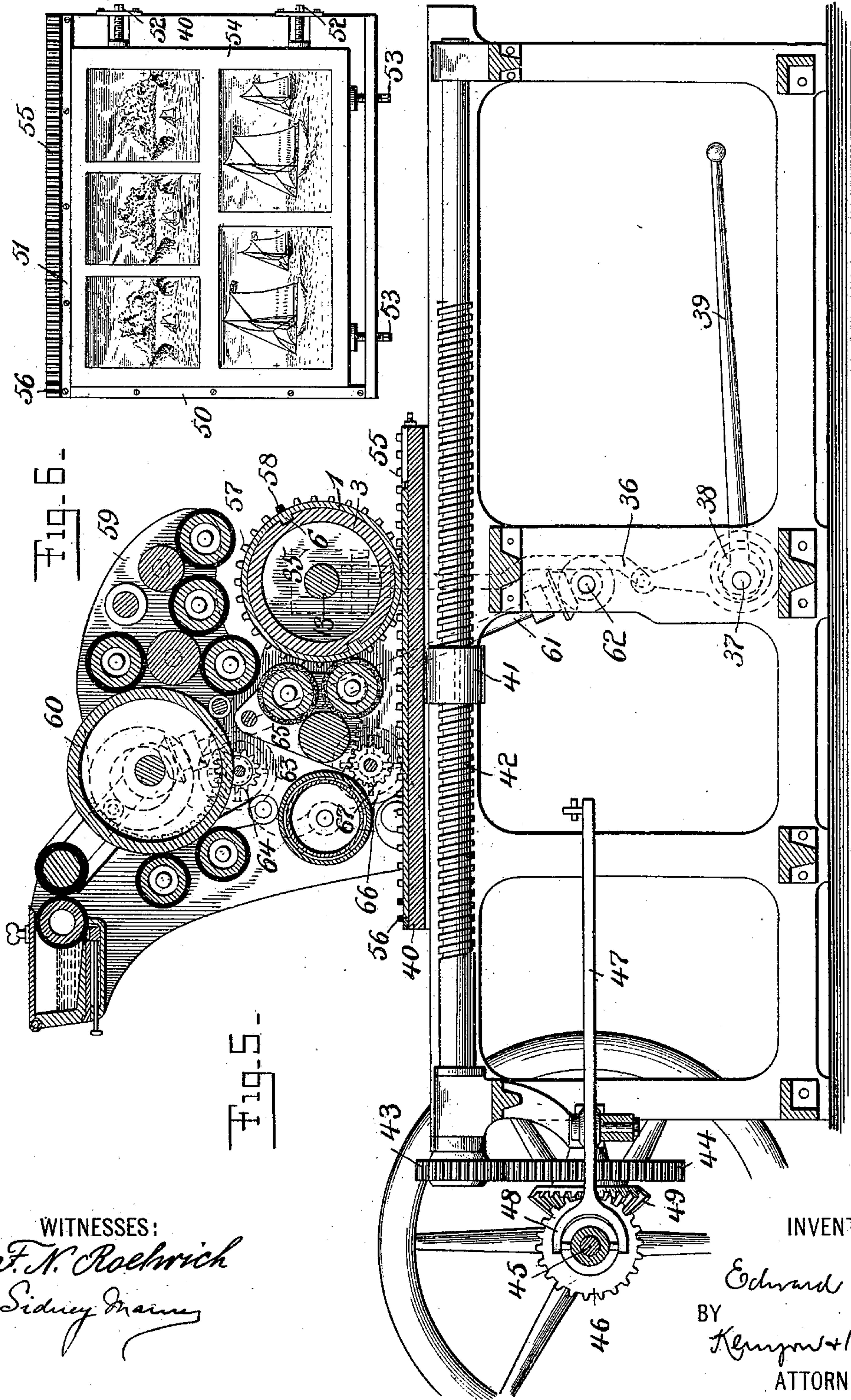
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6 Sheets—Sheet 4.



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6 Sheets—Sheet 5.

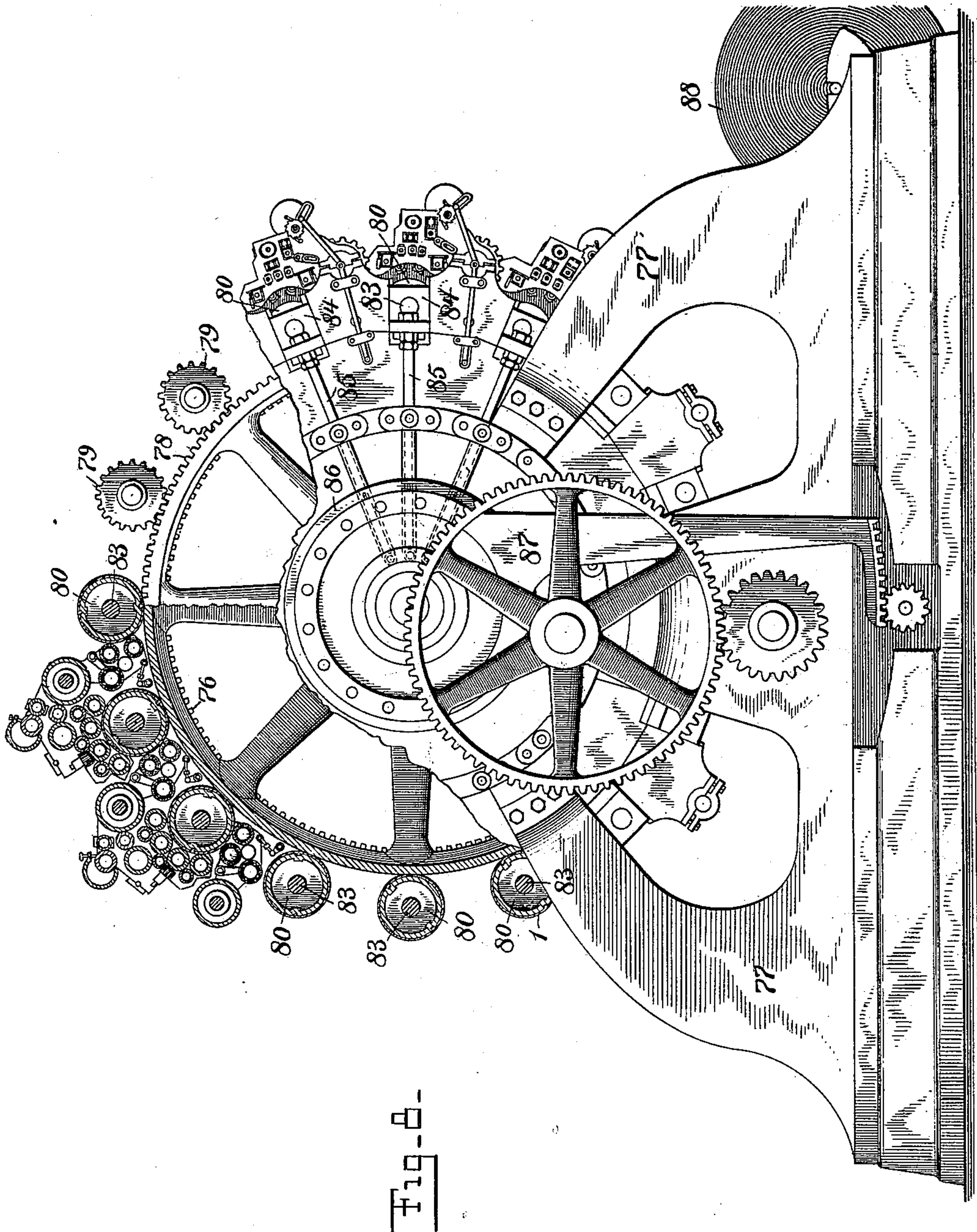


Fig. 5

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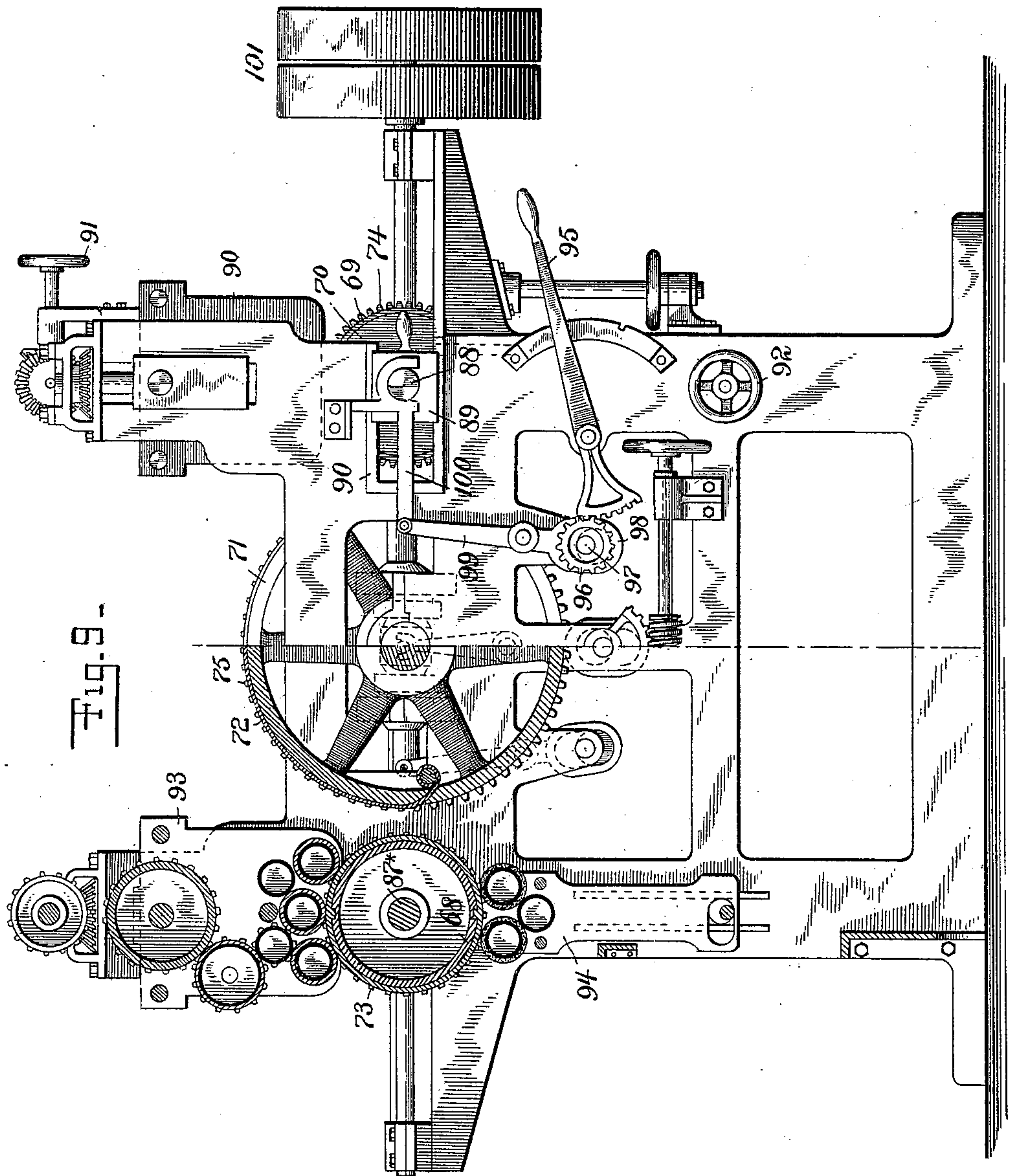
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6 Sheets—Sheet 6.



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MULTICOLOR-PRINTING.

SPECIFICATION forming part of Letters Patent No. 637,559, dated November 21, 1899.

Application filed November 1, 1899. Serial No. 735,448. (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 Multicolor-Printing; 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.

This invention relates to multicolor-printing; and it consists of certain instrumentalities in combination for efficiently carrying out a new method of multicolor-printing devised by me and forming the subject-matter of an application filed concurrently herewith. The said method contemplates three general divisions of procedure. The first division relates to the production of suitable printing-forms, made with substantial accuracy of shape and dimensions, both of which are predetermined with reference to the subsequent treatment and handling of the printing-forms in the second and third divisions of procedure. The second division relates to the careful imposition upon the finished printing-forms of the component designs to be finally printed in accurate register. In this second division the printing-forms are mounted in accurately established and predetermined positions with reference to a coöperating basic surface or a succession of such basic surfaces, preestablished or fixed guiding means being employed to insure immediate and substantial accuracy in attaining the required working relationship of a basic surface and its coating printing-form and of the succession of basic surfaces and their coating printing-forms, where- by the component designs are imparted to or imposed upon the printing-forms to transform them into printing-surfaces which are adapted to automatically register when mounted in a printing-press in which the third division of procedure is carried out. In carrying out the second division of procedure suitable mechanism, such as a transfer-press, is employed. The printing-forms and the basic surfaces are made of predetermined size and shape, so as to accurately fit their accurately made and predetermined seats in the transfer-press and the printing-forms. The transfer-press and

the printing-press are so constructed with reference to each other that the printing-forms when removed from the transfer-press and mounted in the printing-press fit accurately in predetermined places provided to receive them in such printing-press, their position in the printing-press being attained at once and with accuracy by the employment of fixed guides. Thus the printing-surfaces are so made as to be registering printing-surfaces adapted to automatically register in the printing-press and without the trial adjustments heretofore necessary in attaining accurate register in multicolor-printing. This arranging of the printing-forms accurately in their predetermined places in the press and in predetermined relationship with reference to each other and printing therefrom constitute the third division of procedure.

The present invention relates to the instrumentalities devised by me for efficiently carrying out the said method.

In the accompanying drawings, forming part of this specification and in which like reference-numerals designate corresponding parts, I have shown an embodiment of my invention in its preferred form, and I will now proceed to describe it in connection with the said method to be carried out by its means.

Referring now to the drawings shown herein, Figure 1 is a side elevation of a printing-form, partly broken away and before the design is imposed thereon. Fig. 2 is a longitudinal sectional elevation of the same. Fig. 3 is a sectional end elevation of part of the printing-form, and Fig. 4 is a central sectional elevation of an electrolytic-bath apparatus employed in making the said style of printing-form shown in Figs. 1, 2, and 3. Fig. 5 is a central sectional elevation of a transfer-press employed in imposing upon or imparting to the printing-form the design to be printed thereby, and by aid of which transfer-press the printing-form is transferred into a printing-surface for the design so imparted. Fig. 6 is a plan view of the bed of the transfer-press and showing the setting-up plate mounted thereon. Fig. 7 is a diagrammatic view, in sectional elevation, showing a machine which may be advantageously employed in imposing the design to be printed upon a printing-form. Fig. 8 is a side elevation,

partly broken away and in section, of a printing-press in which the printing-surfaces are mounted for printing. Fig. 9 is a side elevation, partly in central section, of a transfer-press embodying the arrangement in Fig. 7.

Referring now to the first division or the production of suitable printing-forms, I prepare in any suitable manner and by any suitable means a series of printing-forms of predetermined size and shape to adapt them to accurately fit in preestablished seats in a printing-press and to fit and work accurately with the cooperating parts of the printing-press. Each printing-form I provide in any suitable manner and by any suitable means with a surface suitable to have imposed upon it and to print a design.

I will now proceed to describe my preferred construction of printing-form and my preferred mode of preparing the same; but I wish it understood that I do not limit myself to such preferred construction and mode, as any other suitable construction or mode may be employed. For example, it is not necessary to an embodiment of my invention in all its broad aspects that the printing-forms be hollow or be composed of bases and form-supports, or that the exterior surface of the printing-form be a separate and distinct part or coating of the printing-form itself, or be a coating at all, or when it is a coating that it be an electrodeposited one. The construction of printing-form and the mode of preparing the same which I prefer to use will now be described. This printing-form and method of making it are of my invention and are made the subject of separate applications filed by me simultaneously herewith.

In constructing my printing-form it is important that it be made of predetermined size and shape, so as to fit accurately the cooperating parts of the press in connection with which it works. This is accomplished by providing a base of accurate predetermined size and shape and applying thereto a coating suitable to receive a design or a plurality of designs and to be developed into a printing-surface therefor. By means of such a base I am enabled to obtain a composite printing-form consisting of the base and the coating applied thereto of accurate predetermined size and shape, so as to accurately fit and work in the predetermined place provided for it in the press. If the coating is quite thin, as it may be in some cases, it may be disregarded in attaining the required size of printing-form, reliance being placed upon the size of the base in obtaining the predetermined size of the printing-form. If, however, as preferred, the coating is of substantial thickness, so as to substantially affect the size of the printing-form, then attention must be paid to the thickness of the coating, which will be necessarily predetermined, in obtaining the predetermined size of the printing-form. The coating is adherent to and integral with the base and it is quite possible and in securing

certain advantages of the invention it is quite important to so apply the coating to the base that the coating may be removed from and renewed on the base, the printing-form with each new coating being made, nevertheless, of predetermined size and shape. In accomplishing this result I employ a base of permanent predetermined size and shape, this permanency of the base persisting throughout the removal and renewals of the coating and either alone or in connection with the predetermined thickness of the coating effecting the predetermined size of the composite printing-form. In removing and renewing the coating it is not always essential that the absolute size of the printing-form be maintained although the same base be used. The absolute size of the printing-form would of course vary in consequence of varying requirements of different cases—that is to say, if the requirements of a particular place in the press and the particular relation of the cooperating parts of the press called for a certain size of printing-form the printing-form would be made of predetermined size and shape to fulfil these requirements, although in so making it the base might have been previously used for a printing-form of a different absolute though predetermined size and shape. Notwithstanding the possible variations in the absolute size of the printing-form the size thereof will in every case be predetermined so as to meet the particular requirements of each case. This is accomplished by applying to the permanent base coatings of varying but predetermined thicknesses. The printing-form is preferably made of metal, consisting of a metallic base and a metallic coating applied thereto by electrodeposition. At present zinc is the most suitable metal of which to form the coating. In the best construction of printing-form I provide a curved shell-like base, preferably a continuous cylindrical tube accurately finished on its interior and having a predetermined and permanently-maintained internal size and shape, so as to adapt it to fit removably and replaceably on a rotary support always accurately in the same place. It will be found advantageous in most cases, moreover, to employ printing-forms of permanently-maintained absolute size and shape, especially where the coating is to be removed from and renewed on a base, because such printing-forms of permanently-maintained size and shape can be the more readily and speedily made and with accuracy and certainty of result. This follows from the fact that standard and permanently-maintained conditions of applying the coating to a base of permanent predetermined size and shape may be employed.

In Figs. 1 and 2 is shown the composite printing-form, comprising the base 1 and the electrodeposited coating 2, the base being shown in said figures as a continuous cylindrical tube and the coating as continuous and seamless thereon. For the sake of economy

and facility of manipulation the printing-form is generally a shell and is provided with a support from which it is removable. The tubular printing-form shown in Figs. 1 and 2 has a cylindrical support 3, and the former has a slight interior taper and the latter a corresponding exterior taper, so that the printing-form may be easily removed from its support, which contacts with and firmly supports every point of the internal periphery of the printing-form. In order that the printing-form may be readily mounted always exactly in its predetermined position on its support 3, suitable guiding means for this purpose are provided, which insure absolute identity and accuracy of position at all times both longitudinally and circumferentially. The guiding means for circumferential or transverse location shown in Figs. 1 and 2 consists of two opposite longitudinal grooves 4 and 5, accurately cut on the exterior surface of the support 3, and corresponding ribs 6 and 7, formed on the interior of the printing-form and adapted to slide and accurately fit in these grooves, a marked rib of the form in a marked groove of the support. For the purpose of insuring identity and accuracy in the longitudinal position of the printing-form on its support the support is provided with a collar 8, screwed on one end of the support, to form a fixed abutment against which one end of the printing-form accurately fits when in place on its supports. The printing-form is locked in place against any accidental longitudinal movement by the clamps 9 and screws 10 on the opposite end of the support. The support 3 is generally provided at the end on which the collar 8 is fixed with a screw 11, extending through a nut 12, adapted to travel to and fro on the screw and arranged to start the printing-form from its seat by the rotation of the screw. If desired, the support 3 may be so constructed as to be removable from its shaft 13, and, if required, the printing-form may be fixed permanently on the form-support and the latter and its shaft provided with guiding means, whereby the removable form-support may be accurately located longitudinally and circumferentially in a predetermined position on the shaft; but the former arrangement is preferred. The base 1 before it has received its coating 2 is made of an accurate predetermined shape and size and with reference to the size of the complete printing-form required. In this permanent shaping and sizing of the base the utmost possible delicacy and refinement of machine work and finish should be used to produce the best results, because it is this shaping and sizing of the base which gives shape and size to the ultimate printing-form, and the expense of the same is permissible because the shape of the base persists permanently thereafter throughout the entire life of the printing-form. The coating should be so manageable in its application that its thickness may be accurately predetermined in or-

der that the composite printing-form, consisting of the base and applied coating, may have an accurately-predetermined total diameter calculated with reference to the exact working position provided for it in the printing-press and in the transfer-press or other mechanism to be subsequently employed in imposing upon the printing-form the design to be printed. This invention provides an apparatus whereby a coating of predetermined thickness may be applied to the base in the manner and for the purposes stated. The apparatus referred to is shown in Fig. 4 in its preferred form and will now be described.

14 is a containing vessel for the electrolyte. Passing through stuffing-boxes in the opposite ends are the shafts 15 and 16, carrying the insulating-heads 17 and 18, respectively. These heads are provided with metallic spring-plates 19, whereby the heads may be centered in the ends of the tubular printing-form 1 in firm metallic contact. The shafts 15 and 16 are adapted to support the printing-form in the electrolyte. Through worm 20, secured upon it, shaft 15 is rotated by worm-shaft 21. Shaft 16 is rotated from shaft 15 by the following means—viz., gear 21^a, secured to the flange of worm-wheel 20 and meshing with gear 22 on shaft 22^a, mounted in the walls of vessel 14, and gear 23, on the opposite end of shaft 22^a, meshing with gear 24, secured on shaft 16. Thus the printing-form may be rotated during the deposition of its metallic coating. Alined with the shaft 15 is a screw-shaft 25, arranged for longitudinal movement and operated by the hand-wheel 26, free to turn thereon. The inner end of this screw-shaft 25 carries a head 27, adapted to enter the outer end of the shaft 15 and held loosely therein by the collar 28, loose on the shaft 25 and adapted to screw on the outer end of the shaft 15. When the shaft 25 is thus connected with the shaft 15, the latter may be moved longitudinally, so as to bring its head 17 into and out of engagement with the printing-form, by rotating the hand-wheel 26, the shaft 15 moving through its stuffing-box, and the gear 20, which is keyed for longitudinal movement on the shaft 15 and which is held from lateral displacement by the worm-shaft 21. The shaft 16 is similarly provided with a screw and accompanying devices. The shafts 15 and 16 are provided with brushes 29 and 30, connected to one pole of a suitable generator, insulated wires 31 and 32 connecting the contact-springs 19 with collars on which the brushes bear. The printing-form constitutes the cathode, and plates 33, consisting of the metal to be deposited, form the anodes. These plates are supported one each side of the printing-form and parallel to its axis and are both connected to the same pole of the generator. Two standards 34 are employed in connection with a pair of lifting-arms (not shown) in moving the printing-form to and

from position. Zinc is the most satisfactory metal with which to coat the base in making the printing-form. Practice in carrying out this invention has demonstrated that this metal may be deposited upon the base in a uniform predetermined thickness, so that the composite printing-form when completed will exactly meet the requirements as to size and shape which adapt the printing-form to fit accurately in its working position in the transfer-press and in the printing-press constructed to receive it, so that it may be brought at once without special adjustment into exact predetermined relationship with the cooperating parts of such presses. For this purpose a standard of solution, of current, of time, and of character of manipulation in the bath are established experimentally, and every base is subjected to the same treatment in accordance with this standard. In effecting the deposition of the zinc upon the base the base is slowly rotated by the mechanism described, and by means of this rotation the entire surface of the base is subjected to precisely identical conditions. Variations of density in the different horizontal or vertical strata of the electrolytic solutions, or variations of conductivity or of capacity for carrying the metal from the anodes to the cathode, or even variation in the anode and cathode all may exist without producing any effect upon the uniformity of the deposited coating either as regards its porosity or thickness, the effects of such variations being counteracted by the rotation of the cylindrical base, which subjects all parts of the exterior surface of the base equally to the identical varying conditions of the electrolyte. The coating thus applied to the base is adherent, coherent, porous, absorbent, even and uniform, and admirably adapted to receive a design imparted to it or imposed upon it and to be developed into a printing-surface for such design. Moreover this zinc coating is more pure than the flat rolled-zinc plates heretofore used for printing and is therefore capable of producing a product of better quality. Impurities that may exist in the zinc-plate anodes, such as if present in the printing-surface would diminish the capacity of the printing-surface for good work, sink to the bottom of the bath when freed from the anodes, and thus are eliminated from the deposited coating. For planographic printing the zinc coating should be about two one-thousandths of an inch in thickness, which under satisfactory working conditions takes about half an hour to be deposited. If the printing-form is to be used for relief-printing, the coating will generally be made somewhat thicker. When the base has received its coating, it is removed from the bath and thoroughly washed off with water and quickly dried without much dripping or evaporation. This zinc coating adheres to the copper base, so as to be integral therewith, and yet may be quickly and completely removed by washing with dilute nitric acid

and rubbing with powdered pumice-stone without removing any part of the base. In this way when it is desired to remove the design of a printing-surface after it has finished its work in printing the entire zinc coating is removed and a fresh coating is applied, which will preferably be identical in thickness with the one removed and which, because of the permanent and unchanged size and shape of the base, will enable the printing-form, with its fresh coating, to fit and work in identically the same place as before. Thus a printing-form may be used over and over indefinitely and with a fresh coating and a new design whenever desired, but remaining always identical in working shape and size, and thus enabling the predetermined and precise relationship of the printing-form and its cooperating parts in the transfer and printing presses to be reliably and accurately maintained.

Referring now to the second division, I impose upon the finished printing-forms the designs to be finally printed in predetermined positions, both longitudinally and transversely or circumferentially, by the aid of fixed guiding means and with reference to the printing of said designs in accurate register, and thereby transform said printing-forms into registering printing-surfaces. I will now proceed to describe suitable means preferably employed by me for carrying out this part of the procedure.

In transforming the printing-form into a printing-surface a design is imposed upon the printing-form, generally by aid of a transfer-press and preferably by aid of a transfer-press such as is shown in Figs. 5 and 6, which will now be described. The printing-forms 1, removably mounted on the support 3, which is carried by the shaft 13, have already been described in connection with Figs. 1, 2, and 3. They are shown in Fig. 6 in their proper position in the transfer-press. The shaft 13 is supported in boxes 35, adapted to slide in vertical recesses in the frame of the press and carried by the arms 36, operatively connected with the shaft 37 by cams 38. The shaft 37 is operated by the lever 39. 40 is a reciprocating bed carrying a nut 41, in which rotates the screw-shaft 42, fixed on which is a gear 43, which is driven by a gear 44. The driving-shaft 45 carries two gears 46, which may be thrown by the arm 47, operating the clutch 48, into or out of mesh with the gear 49 on opposite sides thereof. The gears 49 and 44 turn together. Thus the driving-shaft 45 may drive the bed forward and backward, the bed sliding and being guided in accurately-made slideways. The bed 40 is provided with permanently-fixed plates 50 and 51 at the rear and on one side, against which, as abutments, the setting-up plate is forced by the screws 52 and 53, carried on one side and at the front of the bed. The setting-up plate 54, a permanent flat rigid body of suitable material, such as zinc, is placed and shaped so as to fit

accurately on the bed and against the abutments 50 and 51 and be held firmly in place by the screws 52 and 53 and so that the setting-up plate may repeatedly and reliably be made to occupy exactly the same place or seat on the bed which is thus provided to receive it, the abutments 50 and 51 thus constituting guiding means whereby the setting-up plate may be always located in the same predetermined position on the bed. The bed carries on one side a rack 55, having a marked recess 56. The shaft 13 carries a gear 57, having a marked tooth 58, adapted to fit accurately in the recess 56 of the rack. The designs having been located accurately with care upon the setting-up plate by aid of suitable guide-marks or otherwise and as usually practiced in lithographic transferring and the basic surface thereby formed having been accurately seated in its predetermined position by the aid of the guide-plates, the turning over of the designs from the basic surface upon the printing-form then proceeds. The printing-form is lowered by the arms 37 upon the basic surface always to the same point, the marked tooth 58 of the gear 57 being also carefully entered in the marked recess 56 of the rack 55, and the requisite pressure being exerted by the arms 36 the bed 40 is moved along beneath the printing-form, which is caused to rotate thereon, and by the rolling contact thus effected the design is turned over upon the printing-form. The printing-form is caused to rotate to this end by frictional contact with the basic surface rather than by the meshing of the gear-wheel 57 with the rack 55, as the gear and rack are concerned rather in giving a fixed starting-point always the same for the design-transferring contact of the basic surface and printing-form circumferentially of the printing-form, the marked tooth of the gear and the marked recess of the rack being the only essential parts of the gear and rack, respectively, and constituting fixed guiding means whereby the basic surface and the printing-form, in conjunction with the positive supports for each, are brought into a precise predetermined cooperating relationship in the transfer-press. To insure the printing-form and its coating basic surface and successive printing-forms and their coating basic surfaces always beginning their contact at precisely the same starting-point, this marked tooth and marked recess are employed, thus insuring the attainment of the predetermined relationship desired.

The transfer-press (shown in Fig. 5) is provided with an inking-frame 59, carrying inking-rollers and centered on the shaft of a main ink-distributing roller 60, which is driven by the shaft 61 gearing with the shaft 62. The frame 59 is swung to and fro by the hand-wheel 63, which turns the gear 64, meshing with teeth cut on the frame 59. The transfer-press is also provided with a swinging damping-frame 65, carrying damping-

rollers and swung to and fro by the hand-wheel 66, which turns a gear-wheel 67, meshing with teeth cut on the frame 65. The inking and damping rollers are used for rolling up the printing-form in the process of developing it into a printing-surface. If desired, however, the printing-form may be rolled up and developed apart from the transfer-press. In removing the printing-form from the transfer-press it is generally slipped off from its support without removing the support from the press. The development of the printing-surface may be effected by light etching, so as to make it a permanent planographic-printing surface, or it may be effected by deep etching, so as to make it a permanent relief-printing surface, or it may be developed in any suitable manner and may be routed out, if desired.

In the transformation of the printing-form into a printing-surface, as above described, many departures from the methods heretofore in use are involved. First and most important, the design has been located upon the printing-form in an exact predetermined position and with reference to the use of the printing-surface as a registering printing-surface in the printing operation. This has been effected and made possible by the employment of guiding means whereby the basic surface (consisting of the setting-up plate and the designs thereon in the specific transfer-press described) and the printing-form are brought into a predetermined cooperating relationship with reference to register. It has also been effected in the case of the specific basic surface described by the guiding means whereby the setting-up plate is located in an exact predetermined position on its bed. A series of printing-surfaces bearing component designs may all be made in the same way, each basic surface and its cooperating printing-form being brought into the exact predetermined cooperating relationship required and at once and without delicate adjustment by the use of the guiding means, so that this series of printing-surfaces will be registering printing-surfaces constructed not only to fit in preestablished places in the transfer-press, but also constructed to fit accurately in preestablished places in the printing-press fitted to receive them, so that they will automatically print in register in such press. The basic surface itself may be made in any manner so long as it is capable of imparting by contact to the printing-form the design to be finally printed. Again, the imposition of the designs upon the printing-forms has been effected by rolling contact, (instead of by the contact of one surface upon another under the pressure of a scraper,) the printing-form rotating in bearings which are fixed.

It is often of importance to be able to make interchangeable duplicate printing-surfaces, either to take the place of those worn out in printing a job or where the job is of such

magnitude as to require the simultaneous employment of duplicate printing-surfaces. This invention contemplates mechanism for making such duplicate printing-surfaces each from a previously-prepared printing-surface, whereby the careful and skilful handwork required in preparing the original basic surface is eliminated as regards each duplicate printing-surface. In carrying out this part of the invention a permanent printing-surface, which may be termed the "primary printing-surface," is prepared in any suitable manner, so as to be capable of printing, and may be and preferably is prepared by the aid of an original basic surface, as already described. The primary printing-surface is then brought into proper relation with a printing-form, which may be called the "secondary printing-form," and the design of the former is imparted to the latter either by direct contact therewith or through the intermediation of a suitable positive related conveying-surface, and the secondary printing-form is then developed into a printing-surface, which may be then termed the "secondary printing-surface." As many of these secondary surfaces may be made as desired, all having their designs identically placed thereon and all being identical in size and shape, so as to be interchangeable with each other. Thus from a series of registering primary printing-surfaces a series or a plurality of series of registering secondary surfaces may be made. In carrying out this operation so as to produce registering secondary printing-surfaces or so as to produce a secondary printing-surface which will be a duplicate of the primary printing-surface preestablished permanent seats for such surfaces and for the conveying-surfaces are provided in a machine in which said surfaces accurately fit, and guiding means are employed whereby these surfaces may be brought into predetermined co-operating relationship for the purpose of attaining the predetermined location of the design on the secondary printing-surface required in order that it may automatically register in printing.

In Fig. 7 a primary printing-surface, a conveying-surface, and a secondary printing-form are shown in position such as they would occupy in a suitable machine. The printing-form 1, already developed into a printing-surface, as described, is now the primary printing-surface. It is removably mounted on a supporting-cylinder 68, identical with the supporting-cylinder 3, heretofore described, and is located and locked thereon in a predetermined position by the guiding means identical with those described with reference to Figs. 1 and 2. 69 is the secondary printing-form to be transformed into the secondary printing-surface identical and interchangeable with the printing-surface 1. It is identical in size, shape, and character of material with the printing-surface 1, and is identically mounted upon a supporting-

cylinder 70, identical with the cylinder 68. 71 is a drum carrying a conveying-surface 72, preferably made of rubber, and permanently attached to said drum. The cylinders 68 and 69 and the drum 71 are, respectively, provided with fixed gear-wheels 73, 74, and 75. A tooth and a recess of the gears 73 and 75 are marked so that one fits accurately in the other when the printing-surface and the conveying-surface are brought into operating contact, and a tooth and recess of the gears 74 and 75 are marked so that one may accurately fit in the other when the secondary printing-form 69 and the conveying-surface are brought into operating contact. These marked teeth and recesses constitute guiding means whereby the primary printing-surface and the conveying-surface and the secondary printing-form may be brought accurately into predetermined relationship with reference to the required location of the design to be imparted to the secondary printing-form, so as to make it a registering printing-surface. When the primary printing-surface, suitably inked, and the conveying-surface are brought into firm contact and caused to roll the one against the other, an impression is imparted from the former to the latter. The conveying-surface and the secondary printing-form are then brought into firm contact and the impression on the former is imparted to the latter. The secondary printing-form is then suitably developed into a printing-surface for that design and is identical and interchangeable with the primary printing-surface. The gear-wheels 73, 74, and 75 are not employed for the purpose of communicating motion from one surface to the other, but rather because taken in conjunction with the positive lateral supports they are convenient in providing by their marked teeth and recesses the guiding means required, as already described. Motion is conveyed from one surface to the other by the friction engendered by the firm contact of these surfaces the one with another, as described. It will be observed that the conveying-surface 72 in its relation to the secondary printing-form 74 is a basic surface. Instead of fixing the conveying-surface upon a rotary drum, as described, it may be fixed upon a reciprocating bed.

Referring now to the third division of procedure, I arrange the said printing-forms, with the designs imposed upon them, in their preestablished seats in a printing-press and in predetermined relationship with reference to each other, suitable fixed guiding means being employed to enable this predetermined relationship to be at once attained both longitudinally and transversely or circumferentially and without the usual empiric adjustment. I am thereby enabled to print from said printing-surfaces in accurate register and in approximately instantaneous succession. I will now proceed to describe suitable means preferably employed by me for carrying out this part of my invention.

When a series of registering printing-surfaces have been completed, they are then ready to be used in printing. For this purpose a printing-press is provided which may be of any suitable construction—for example, such as that shown in Fig. 8—having therein preestablished seats for the series of printing-surfaces, so that when the printing-surfaces are mounted therein they may print at once in accurate register, guiding means being employed for the purpose of bringing each printing-surface at once into the required and exact predetermined relation to the other printing-surfaces. The press shown in Fig. 8 is a sixteen-color press, and it is constructed and designed to print in rapid succession sixteen registering component impressions in as many colors and on the web. 76 is the impression-drum having a uniformly elastic and resistant surface and carried on a shaft centered in bearings in the main frame 77. This drum carries a gear 78, which meshes with identical gears 79, carried with the sixteen supporting-cylinders 80, which are supported to rotate in fixed bearings provided in the main frame and surrounding the impression-drum. The supporting-cylinders 80 are identical in size and shape with each other and are all preferably identical with the form-cylinder 3. (Shown in Figs. 1 and 2.) They all carry removable cylindrical printing-surfaces 1 81 82, &c., which bear registering component designs and which are designed and adapted to register in printing. The supporting-cylinders 80 are each fixed to shafts 83, supported in sliding boxes 84, fitting in recesses in the main frame. Each pair of boxes 84 is provided with a pair of arms 85, one on each side of the press and which have their outer ends connected to the boxes and their inner ends connected for reciprocating movement by suitable means with an annular plate 86, bolted to an arm 87, turning on the hub of the shaft of the impression-drum. This arm is operated by suitable means and when turned in one direction the radial arms 85 for all the printing-surfaces are moved outward, so as to carry the printing-surfaces out of contact with the impression-surface, and when the arm 87 is turned in the opposite direction the printing-surfaces are all brought into contact with the impression-surface. Each printing-surface is provided with inking and damping frames carrying inking and damping rollers, respectively, as shown. 88 is the roll of paper which constitutes the web impression-surface and which is fed around the impression-drum, so as to receive the impressions of the printing-surfaces each in turn and in rapid succession and in automatic register. For the purpose of attaining this register accurately and at once each gear 79 has a marked tooth designed and adapted to enter a marked recess of the gear 78 when that marked recess reaches it in the original adjusting revolution of the drum, this with the positive seating of the printing-surfaces

constituting the guiding means for bringing the printing-surfaces into the required exact predetermined relation with respect to each other.

Referring now to Fig. 9, the supporting-cylinders 68 and 70 are carried on shafts 87 and 88, mounted in sliding boxes 89, arranged to move in the slideways 90, formed in the frame of the machine, whereby the printing-surface 1 and the printing-form 69 on said supporting-cylinders may be moved into and out of contact with the conveying-surface 72 on the drum 71. The printing-form 69 is provided with a vertically-moving inking-frame 90, arranged, by suitable mechanism actuated by the hand-wheel 91, to be moved to and from the printing-form, so that the printing-form may be rolled up in the machine after it has received its impression from the conveying-surface. The printing-form 69 is also provided with a vertically-moving damping-frame actuated by the hand-wheel 92. The printing-surface 1 is provided with inking and damping frames 93 and 94, respectively, similar to those employed in connection with the printing-form 69. 95 is a lever having at its inner end a segmental rack engaging a rack 96, fixed on a shaft 97, which carries cams 98, engaging levers 99, pivoted on opposite sides of the machine. The upper ends of these levers carry arms 100, which engage the ends of the shaft 88. The operation of the arm 95 moves the shaft 88 and with it the supporting-cylinders and supporting-frame carried thereon. Similar means are provided for moving the shaft 87 and the supporting and printing surface carried thereby. 101 is a pulley on the driving-shaft whereby the drum 71 is driven and with it the printing-surfaces 73 of the printing-form 69, when either of these is in contact with the conveying-surface.

In the practical use of this invention much of the work will be done with printing-surfaces which are graduated—that is to say, the printing-surfaces will be so prepared as to make impressions in which the ink will be distributed in graduated quantities for light and shade effects, depth of color, &c. These graduated printing-surfaces will be employed in nearly all cases where pictures are to be printed, and the designs on the printing-surfaces will generally be prepared so as to print overlapping impressions.

While the various marked advantages of this invention will be especially available in rotary printing, yet it is to be noted that certain advantages of the invention may be availed of in connection with flat printing-surfaces and a reciprocating printing-press, so that the invention is not to be restricted in all cases to rotary printing.

The electrolytic-bath apparatus (shown in Fig. 4) is the subject of a special application filed by me on January 13, 1897, Serial No. 619,041; and the same is not herein claimed alone and separately considered. The trans-

fer-press shown in Figs. 5 and 6 is the subject of special applications filed by me on January 23, 1899, Serial No. 703,082, and on October 4, 1899, Serial No. 732,437, and the same is not herein claimed alone and separately considered. The transfer-press shown in Figs. 7 and 9 is the subject of special applications filed, respectively, by me October 4, 1899, Serial Nos. 732,439 and 732,440, and January 5, 1899, Serial No. 701,192, and the same is not herein claimed alone and separately considered. The printing-press shown in Fig. 8 is the subject of a special application filed by me on June 1, 1896, Serial No. 593,796, and the same is not herein claimed alone and separately considered.

My improved method or process set forth herein is not claimed in this application, but is the subject of my application filed and executed simultaneously herewith.

In alluding to the positions of the printing-forms on their respective supports and to their cooperating relation and to the cooperating relation of the conveying-surface I use the terms "longitudinally" and "transversely" as referring to the two directions at right angles to each other over said bodies, whether either or both of these bodies are flat or curved. If the body is curved, "longitudinal" would refer to axial direction and "transverse" to circumferential direction.

The method of electrolytically depositing the coating upon the base shown and described herein with reference to the electrolytic bath is not herein separately claimed, such method being made the subject of a separate application executed and filed by me simultaneously herewith.

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

1. The combination of a series of supports for printing-forms, identical in working size and shape and constructed and designed to fit in preestablished seats in a printing-press; a series of metallic shell-like bases for printing-forms of predetermined size and shape and constructed and designed to removably and replaceably fit on said form-supports in precise predetermined positions, said bases having each a uniform coating of electrodeposited metal suitable to have imposed thereon and to print a design, said coatings being removable from and renewable on their bases without affecting the permanent size and shape of the bases, a base and its coating constituting a printing form; a transfer-press provided with a removable basic surface having a rigid base of predetermined permanent size and shape, said press having fixed mechanical guides whereby the basic surface may be brought always and at once into the same preestablished seat therefor, said transfer-press having also a preestablished seat for the form-supports carrying their printing-forms and having also fixed guiding means whereby each printing-form and its basic surface may be brought accurately and at once

in exact predetermined cooperating relation, whereby the designs of the basic surfaces may be imposed upon the printing-forms in exact predetermined positions with reference to the attainment of register in printing with said printing-forms when developed into printing-surfaces; a multicolor-printing press having preestablished seats therein constructed to receive the form-supports carrying their printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric adjustments, with respect to each other and with reference to register in printing.

2. The combination of a series of supports for printing-forms, identical in working size and shape and constructed and designed to fit in preestablished seats in a printing-press; a series of metallic shell-like bases for printing-forms of predetermined size and shape and constructed and designed to removably and replaceably fit on said form-supports in precise predetermined positions, said bases being each adapted to receive and retain a uniform coating of electrodeposited metal suitable to have imposed thereon and to print a design; an electrolytic-bath apparatus provided with rotating shafts adapted to removably support said bases and rotate them in the electrolyte whereby under standard conditions said bases may receive and retain uniform coatings of predetermined thickness and with reference to the predetermined size and shape of the printing-forms, each consisting of its base and its electrodeposited coating; a transfer-press provided with a removable basic surface having a rigid base of predetermined permanent size and shape, said press having fixed mechanical guides whereby the basic surface may be brought always and at once into the same predetermined seat therefor, said transfer-press having also a preestablished seat for the form-supports carrying their printing-forms and having also fixed guiding means whereby each printing-form and its basic surface may be brought accurately and at once in exact predetermined cooperating relation, whereby the designs of the basic surfaces may be imposed upon the printing-forms in exact predetermined positions with reference to attainment of register in printing with said printing-forms when developed into printing-surfaces; a multicolor-printing press having preestablished seats therein constructed to receive the form-supports carrying their printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined positions at once and without the usual empiric adjustments, with respect to each other and with reference to register in printing.

3. The combination of a series of supports for printing-forms, identical in working size and shape and constructed and designed to fit in preestablished seats in a printing-press;

a series of metallic bases for printing-forms of predetermined size and shape and constructed and designed to removably and replaceably fit on said form-supports in precise predetermined positions, said bases having each a uniform coating of electrodeposited metal suitable to have imposed thereon and to print a design, the coatings for the several bases being of predetermined thickness with reference to the accurate fitting and working of said printing-forms with the cooperating parts of said printing-press, said coatings being removable from and renewable on their bases without affecting the predetermined size and shape of the bases, a base and its coating constituting a printing-form; a transfer-press provided with a removable basic surface having a rigid base of predetermined size and shape, said press having fixed mechanical guides whereby the basic surface may be brought always and at once into the same preestablished seat therefor, said transfer-press having also a preestablished seat for the form-supports carrying their printing-forms and having also fixed guiding means whereby each printing-form and its basic surface may be brought accurately and at once in exact predetermined cooperating relation, whereby the designs of the basic surface may be imposed upon the printing-forms in exact predetermined positions with reference to the attainment of register in printing with said printing-forms when developed into printing-surfaces; a multicolor-printing press having preestablished seats therein constructed to receive the form-supports carrying their printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined position, at once and without the usual empiric adjustments, with respect to each other and with reference to register in printing.

4. The combination of a series of rotary supports for printing-forms, identical in working size and shape and constructed and designed to fit in preestablished seats in a printing-press; a series of metallic tubular bases for printing-forms of predetermined size and shape and constructed and designed to removably and replaceably fit on said form-supports in precise predetermined positions, said bases having each a uniform coating of electrodeposited zinc suitable to have imposed thereon and to print a design, the coatings for the several bases being of predetermined thickness with reference to the accurate fitting and working of said printing-forms with the cooperating parts of said printing-press, said coatings being removable from and renewable on their bases without affecting the permanent size and shape of the bases, a base and its coating constituting a printing-form; a transfer-press provided with a removable basic surface having a rigid base of predetermined permanent size and shape; said press having fixed mechanical guides whereby the basic surface may be brought always and at once into the

same preestablished seat therefor, said transfer-press having also a preestablished seat for the form-supports carrying their printing-forms and having also fixed guiding means whereby each printing-form and its basic surface may be brought accurately and at once in exact predetermined cooperating relation, whereby the designs of the basic surfaces may be imposed upon the printing-forms in exact predetermined positions with reference to the attainment of register in printing with said printing-forms when developed into printing-surfaces; a multicolor-printing press having preestablished seats therein constructed to receive the form-supports carrying their printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric adjustments, with respect to each other and with reference to register in printing.

5. The combination of a series of printing-forms, each having a planographic surface, suitable to have imposed upon it, and to print, a design, said printing-forms being made of a predetermined size and shape to adapt them to accurately fit in preestablished seats in a printing-press and to fit and work accurately with the cooperating parts of the printing-press; a transfer-press provided with a removable basic surface having a rigid base of predetermined permanent size and shape, said press having fixed mechanical guides whereby the basic surface may be brought always and at once into the same preestablished seat therefor, said transfer-press having a preestablished seat for the printing-forms and having also fixed guiding means whereby each printing-form and its basic surface may be brought accurately and at once in exact predetermined cooperating relation, whereby the designs of the basic surfaces may be imposed upon the printing-forms in exact predetermined positions with reference to the attainment of register in printing with said printing-forms when developed into printing-surfaces; a multicolor-printing press having preestablished seats therein constructed to receive the printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric adjustments, with respect to each other and with reference to register in printing.

6. The combination of a series of rotary supports for printing-forms, identical in working size and shape and constructed and designed to fit in preestablished seats in a rotary printing-press; a series of tubular printing-forms of predetermined size and shape and constructed and designed to removably and replaceably fit on said form-supports in precise predetermined positions, said printing-forms having each a planographic surface suitable to have imposed upon it and to print, a design, and said printing-forms, when fitted on

said form-supports, being of the same predetermined size and shape for accurate fitting and working with the cooperating parts of the press; a transfer-press provided with a removable basic surface having a rigid base of predetermined permanent size and shape, said press having fixed mechanical guides whereby the basic surface may be brought always and at once into the same preestablished seat therefor, said transfer-press having also a preestablished seat for the form-supports carrying their printing-forms and having also fixed guiding means whereby each printing-form and its basic surface may be brought accurately and at once in exact predetermined cooperating relation, whereby the designs of the basic surfaces may be imposed upon the printing-forms by rolling contact in exact predetermined positions with reference to the attainment of register in printing with said printing-forms when developed into printing-surfaces; a rotary multicolor-printing press having preestablished seats therein constructed to receive the form-supports carrying their printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric adjustments, with respect to each other and with reference to register in printing.

7. The combination of a series of rotary supports for printing-forms, identical in working size and shape and constructed and designed to fit in preestablished seats in a rotary printing-press; a series of metallic shell-like bases for printing-forms constructed and designed to removably and replaceably fit on said form-supports in precise predetermined positions, said bases having each a coating of electrodeposited metal suitable to have imposed thereon and to print, a design, the bases with their coatings thereon being of equal and predetermined thickness with reference to the accurate fitting and working of said printing-forms with the cooperating parts of the press, said coatings being removable from and renewable upon their bases without affecting the permanent size and shape of the printing-forms, a base and its coating constituting a printing-form; a transfer-press provided with a removable basic surface having a rigid base of predetermined permanent size and shape said press having fixed mechanical guides whereby the basic surface may be brought always and at once into the same preestablished seat therefor, said transfer-press having also a preestablished seat for the form-supports carrying their printing-forms and having also fixed guiding means whereby each printing-form and its basic surface may be brought accurately and at once in exact predetermined cooperating relation, whereby the designs of the basic surfaces may be imposed upon the printing-forms by rolling contact in exact predetermined positions with reference to the attainment of register in printing with

said printing-forms when developed into printing-surfaces; a rotary multicolor-printing press having preestablished seats therein constructed to receive the form-supports carrying their printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric adjustments, with respect to each other and with reference to register in printing.

8. The combination of a series of printing-forms constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press, said press having also an accurate preestablished seat adapted to receive successively the printing-forms and having also an accurate preestablished seat for a basic surface or a series of basic surfaces; guiding means associated with said press whereby a printing-form and its cooperating basic surface may be brought at once into exact predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having an accurate preestablished seat constructed to successively receive the said printing-forms and to operate with them as primary printing-surfaces; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms; and guiding means associated with said second transfer-press, whereby a primary printing-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the design of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering printing-surfaces.

9. The combination of a series of rotary printing-forms constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press having also an accurate preestablished seat adapted to receive successively the printing-forms and having also an accurately preestablished seat for a basic surface or a series of basic surfaces; guiding means associated with said press whereby a printing-form and its cooperating basic surface may be brought at once into exact predetermined cooperating

relation both longitudinally and transversely and whereby the design of the basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having an accurate preestablished seat constructed to successively receive the said printing-forms and to operate with them as primary printing-surfaces; a series of rotary secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press, said second transfer printing-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms; and guiding means associated with said second transfer-press, whereby a primary printing-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the design of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering printing-surfaces.

10. The combination of a series of shell-like printing-forms removably carried on rotary supports, constructed and designed to fit successively in an accurate preestablished seat in a transfer-press when mounted on said rotary supports; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press, said press having also an accurate preestablished seat adapted to receive successively the printing-forms, when mounted on their supports, and having also an accurate preestablished seat for a basic surface or a series of basic surfaces, guiding means associated with said press whereby a printing-form and its support and its cooperating basic surface may be brought at once into exact predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having an accurate seat preestablished constructed to successively receive the said printing-forms, when mounted on their supports, and to operate with them as primary printing-surfaces; a series of shell-like secondary printing-forms removably carried on rotary supports and adapted to have imposed thereon and to print designs and constructed and designed to fit when thus mounted in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms when thus mounted; and guiding means associated with said second transfer-press whereby a primary printing-surface and a secondary printing-form may be brought

into exact cooperating relation both longitudinally and transversely and whereby the designs of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of secondary printing-forms as registering printing-surfaces.

11. The combination of a series of printing-forms constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press, said press having also an accurate preestablished seat adapted to receive successively the printing-forms and having also an accurate preestablished seat for a basic surface or a series of basic surfaces; guiding means associated with said press whereby a printing-form and its cooperating basic surface may be brought into contact in predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having an accurate preestablished seat constructed to successively receive the said printing-forms and to operate with them as primary printing-surfaces; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms; and guiding means associated with second transfer-press, whereby a primary printing-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the design of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering printing-surfaces.

12. The combination of a series of printing-forms constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press, said press having also an accurate preestablished seat adapted to receive successively the printing-forms and having also an accurate preestablished seat for a basic surface or a series of basic surfaces; guiding means associated with said press whereby a printing-form and its cooperating basic surface may be brought at once into exact predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact

predetermined position with reference to register; a second transfer-press having an accurate preestablished seat constructed to successively receive the said printing-forms and
 5 to operate with them as primary printing-surfaces; a series of secondary printing-forms adapted to have imposed upon them and to print designs and constructed and designed to fit in accurate preestablished seats in a
 10 printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms; and guiding means associated with said second transfer-press, whereby a pri-
 15 mary printing-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the design of the primary printing-surfaces may be imposed upon
 20 the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering printing-surfaces; a multicolor-printing press having preestablished seats
 25 therein constructed to receive the secondary printing-surfaces and provided with fixed guides, whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric
 30 adjustments, with respect to the impression-surface and to each other and with reference to register in printing.

13. The combination of a series of printing-forms constructed and designed to fit success-
 35 sively in an accurate preestablished seat in a transfer-press; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press, said press hav-
 40 ing also an accurate preestablished seat adapted to receive successively the printing-forms and having also an accurate preestablished seat for a basic surface or a series of basic surfaces; guiding means associated
 45 with said press whereby a printing-form and its cooperating basic surface may be brought at once into exact predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic
 50 surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having a conveying-surface and also having an accurate preestablished seat constructed
 55 to successively receive the said printing-forms and to operate with them as primary printing-surfaces; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and de-
 60 signed to fit in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms, said second transfer-press be-
 65 ing provided with means whereby the conveying-surface may be brought into contact with a primary printing-surface to receive an

impression and then with a secondary printing-form to impart its impression to the secondary printing-form; and guiding means
 70 associated with said second transfer-press whereby a primary printing-surface, a conveying-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and
 75 whereby the design of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering
 80 printing-surfaces.

14. The combination of a series of rotary printing-forms constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a transfer-press pro-
 85 vided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press, said press having also an accurate preestablished seat adapted to receive successively the
 90 printing-forms and having also an accurate preestablished seat for a basic surface or a series of basic surfaces; guiding means associated with said press, whereby a printing-form and its cooperating basic surface may
 95 be brought at once into exact predetermined cooperating relation, both longitudinally and transversely, and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with
 100 reference to register; a second transfer-press having a conveying-surface and also having an accurate preestablished seat constructed to successively receive the said printing-forms and to operate with them as primary printing-
 105 surfaces; a series of rotary secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press, said second transfer-press hav-
 110 ing an accurate preestablished seat adapted to receive successively said secondary printing-forms, said second transfer-press being provided with means, whereby the conveying-surface may be brought into contact with a
 115 primary printing-surface to receive an impression and then with a secondary printing-form to impart its impression to the secondary printing-form; and guiding means associated with said second transfer-press, whereby a
 120 primary printing-surface, a conveying-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the design of the primary printing-surface
 125 may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering printing-surfaces.
 130

15. The combination of a series of shell-like printing-forms removably carried on rotary supports, constructed and designed to fit successively in an accurate preestablished

seat in a transfer-press when mounted on said rotary supports; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press, said press having also an accurate preestablished seat adapted to receive successively the printing-forms, when mounted on their supports, and having also an accurate preestablished seat for a basic surface or a series of basic surfaces; guiding means associated with said press, whereby a printing-form and its support and its cooperating basic surface may be brought at once into exact predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having a conveying-surface and also having an accurate preestablished seat constructed to successively receive the said printing-forms, when mounted on their supports, and to operate with them as primary printing-surfaces; a series of shell-like secondary printing-forms removably carried on rotary supports and adapted to have imposed thereon and to print designs and constructed and designed to fit, when thus mounted in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms, when thus mounted, said second transfer-press being provided with means, whereby the conveying-surface may be brought into contact with the primary printing-surface to receive an impression and then with a secondary printing-form to impart its impression to the secondary printing-form; and guiding means associated with said second transfer-press, whereby a primary printing-surface, a conveying-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the designs of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the use subsequently of said secondary printing-forms as registering printing-surfaces.

16. The combination of a series of printing-forms constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press, said press having also an accurate preestablished seat adapted to receive successively the printing-forms and having also an accurate preestablished seat for a basic surface or a series of basic surfaces; guiding means associated with said press, whereby a printing-form and its cooperating basic surface may be brought at once into exact predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having a conveying-surface and also having an accurate preestablished seat constructed and designed to successively receive the said printing-forms and to operate with them as primary printing-surfaces; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms, said second transfer-press being provided with means whereby the conveying-surface may be brought into con-

nally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having a conveying-surface and also having an accurate preestablished seat constructed to successively receive the printing-forms and to operate with them as primary printing-surfaces; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms, said second transfer-press being provided with means, whereby the conveying-surface may be brought into contact with a primary printing-surface to receive an impression and then with a secondary printing-form to impart its impression to the secondary printing-form; and guiding means associated with said second transfer-press, whereby a primary printing-surface, a conveying-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the design of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering printing-surfaces.

17. The combination of a series of printing-forms constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat in said press, said press having also an accurate preestablished seat adapted to receive successively the printing-forms and having also an accurate preestablished seat for a basic surface or a series of basic surfaces; guiding means associated with said press, whereby a printing-form and its cooperating surface may be brought at once into exact and predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having a conveying-surface and also having an accurate preestablished seat constructed and designed to successively receive the said printing-forms and to operate with them as primary printing-surfaces; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms, said second transfer-press being provided with means whereby the conveying-surface may be brought into con-

tact with a primary printing-surface to receive an impression and then with a secondary printing-form to impart its impression to the secondary printing-form; and guiding means associated with said second transfer-press, whereby a primary printing-surface, a conveying-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the design of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering printing-surfaces; a multicolor-printing press having preestablished seats therein constructed to receive the secondary printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric adjustments, with respect to each other and with reference to register in printing.

18. The combination of a series of primary printing-surfaces having component designs and constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press; a transfer-press having accurate preestablished seats adapted to removably receive the primary printing-surfaces and the secondary printing-forms in pairs, a primary printing-surface and a secondary printing-form together, said transfer-press having means whereby the design of a primary printing-surface may be imparted to a secondary printing-form by contact, guiding means associated with said press whereby each primary printing-surface and its corresponding secondary printing-form may be brought into an exact cooperating relation both longitudinally and transversely whereby the designs of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions and with reference to register; a printing-press having accurate preestablished seats constructed to receive said secondary printing-forms and to operate therewith as cooperating registering printing-surfaces; guiding means associated with said printing-press whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric adjustments, with respect to each other and with reference to register.

19. The combination of a series of rotary primary printing-surfaces having component designs and constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a series of rotary secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate pre-

established seats in a printing-press; a transfer-press having accurate preestablished seats adapted to removably receive the primary printing-surfaces and the secondary printing-forms in pairs, a primary printing-surface and a secondary form together, said transfer-press having means whereby the design of a primary printing-surface may be imparted to a secondary form by contact; guiding means associated with said press whereby each primary printing-surface and its corresponding secondary printing-form may be brought into an exact cooperating relation both longitudinally and transversely whereby the designs of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions and with reference to register; a printing-press having accurate preestablished seats constructed to receive said secondary printing-forms and to operate therewith as cooperating registering printing-surfaces, guiding means associated with said printing-press whereby said printing-surfaces may be brought into exact predetermined position, at once and without the usual empiric adjustments, with respect to each other and with reference to register.

20. The combination of a series of shell-like printing-surfaces, removably carried in rotary supports, having component designs and constructed and designed to fit successively in an accurate preestablished seat in a transfer-press when mounted on said rotary supports; a series of shell-like secondary printing-forms removably carried on rotary supports and adapted to have imposed thereon and to print designs and constructed and designed to fit, when so mounted in accurate preestablished seats in a printing-press; a transfer-press having accurate preestablished seats adapted to removably receive the primary printing-surface and the secondary printing-forms in pairs, a primary printing-surface and a secondary printing-form together, said transfer-press having means whereby the design of a primary printing-surface may be imparted to a secondary printing-form by contact; guiding means associated with said press whereby each primary printing-surface and its corresponding secondary printing-form may be brought into an exact cooperating relation, both longitudinally and transversely, whereby the designs of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions and with reference to register; a printing-press having accurate preestablished seats constructed to receive said secondary printing-forms and to operate therewith as cooperating registering printing-surfaces; guiding means associated with said printing-press whereby printing-surfaces may be brought into exact predetermined position, at once and without the usual empiric adjustments, with respect to each other and with reference to register.

21. The combination of a series of primary

printing-surfaces having component designs and constructed and designed to fit successively in an accurate preestablished seat in a transfer-press, and provided with devices for inking said primary printing-surfaces; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press; a transfer-press having accurate preestablished seats adapted to removably receive the primary printing-surfaces and the secondary forms in pairs, a primary printing-surface and a secondary printing-form together, said transfer-press having means whereby the design of a primary printing-surface may be imparted to a secondary printing-form by contact; guiding means associated with said press whereby each primary printing-surface and its corresponding secondary form may be brought into exact cooperating relation both longitudinally and transversely whereby the designs of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions and with reference to register; a printing-press having accurate preestablished seats constructed to receive said secondary printing-forms and to operate therewith as cooperating registering printing-surfaces; guiding means associated with said printing-press whereby said printing-surfaces may be brought into exact predetermined position, at once and without the usual empiric adjustments, with respect to each other and with reference to register.

22. The combination of a series of primary printing-surfaces having component designs and constructed and designed to fit successively in an accurate preestablished seat in a transfer-press; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press; a transfer-press having a conveying-surface and also having accurate preestablished seats adapted to removably receive the primary printing-surfaces and the secondary printing-forms in pairs, a primary printing-surface and a secondary printing-form together, said transfer-press having means whereby the design of a primary printing-surface may be imparted to a secondary printing-form by contact; said transfer-press being provided with means whereby the conveying-surface may be brought into contact with a primary printing-surface to receive an impression and then with a secondary printing-form to impart its impression to the secondary printing-form; guiding means associated with said press whereby each primary printing-surface, a conveying-surface and its corresponding secondary printing-form may be brought into an exact cooperating relation both longitudinally and transversely whereby the designs of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined posi-

tions and with reference to register; a printing-press having accurate preestablished seats constructed to receive said secondary printing-forms and to operate therewith as cooperating registering printing-surfaces; guiding means associated with said printing-press whereby said printing-surfaces may be brought into exact predetermined position, at once and without the usual empiric adjustments, with respect to each other and with reference to register.

23. The combination of a series of printing-forms, made of a predetermined size and shape to adapt them to accurately fit and work accurately with the cooperating parts of a printing-press, said printing-forms having each a coating of electrodeposited metal suitable to have imposed upon it and to print a design, said coatings being removable from and replaceable on the printing-forms without affecting the permanent size and shape of the latter; a transfer-press provided with a removable basic surface having a rigid base of predetermined permanent size and shape, said press having fixed mechanical guides whereby the basic surface may be brought always and at once into the same preestablished seat therefor, said transfer-press having also a preestablished seat for the printing-forms and having also fixed guiding means whereby each printing-form and its basic surface may be brought accurately and at once in exact predetermined cooperating relation, whereby the designs of the basic surfaces may be imposed upon the printing-forms by rolling contact in exact predetermined positions, with reference to the attainment of register in printing with said printing-forms when developed into printing-surfaces; a multicolor-printing press having preestablished seats therein constructed to receive the printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric adjustments, with respect to each other and with reference to register in printing.

24. The combination of a series of supports for printing-forms, identical in working size and shape and constructed and designed to fit in preestablished seats in a printing-press; a series of printing-forms, made of a predetermined size and shape and constructed and designed to removably and replaceably fit on said form-supports in precise predetermined positions, said printing-forms having each a coating of electrodeposited metal suitable to have imposed upon it and to print a design, said coatings being removable from and renewable on the printing-forms without affecting the permanent size and shape of the latter; a transfer-press provided with a removable basic surface having a rigid base of predetermined permanent size and shape, said press having fixed mechanical guides whereby the basic surface may be brought always and at once into the same preestablished seat in

the transfer-press, the transfer-press also having a preestablished seat for the form-supports carrying their printing-forms and having also fixed guiding means whereby each printing-form and its basic surface may be brought accurately and at once in exact predetermined cooperating relation, whereby the designs of the basic surfaces may be imposed upon the printing-forms by rolling contact in exact predetermined positions with reference to the attainment of register in printing with said printing-forms when developed into printing-surfaces; a multicolor-printing press having preestablished seats therein constructed to receive the form-supports carrying their printing-surfaces and provided with fixed guides whereby said printing-surfaces may be brought into exact predetermined positions, at once and without the usual empiric adjustments, with respect to each other and with reference to registering in printing.

25. The combination of a series of printing-forms, made of a predetermined size and shape to adapt them to accurately fit and work accurately with the cooperating parts of a transfer-press, said printing-forms having each a coating of electrodeposited metal suitable to have imposed upon it and to print a design, said coatings being removable from and renewable on the printing-forms without affecting the permanent size and shape of the latter; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurate preestablished seat therefor, the transfer-press also having an accurate preestablished seat adapted to receive successively the printing-forms; guiding means associated with said press whereby a printing-form and its cooperating basic surface may be brought at once into exact predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having an accurate preestablished seat constructed to successively receive the said printing-forms and to operate with them as primary printing-surfaces; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms; and guiding means associated with said second transfer-press whereby a primary printing-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the design of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering printing-surfaces.

26. The combination of a series of printing-forms, made of a predetermined size and shape to adapt them to accurately fit and work accurately with the cooperating parts of a transfer-press, said printing-forms having each a coating of electrodeposited metal suitable to have imposed upon it and to print a design, said coatings being removable from and renewable on the printing-forms without affecting the permanent size and shape of the latter; a transfer-press provided with a removable basic surface constructed and designed to removably fit in an accurately-preestablished seat adapted to receive successively the printing-forms and having also an accurate preestablished seat for a basic surface or a series of basic surfaces; guiding means associated with said press whereby a printing-form and its cooperating basic surface may be brought at once into exact predetermined cooperating relation both longitudinally and transversely and whereby the design of a basic surface may be imposed upon the printing-form in exact predetermined position with reference to register; a second transfer-press having a conveying-surface and also having an accurate preestablished seat constructed to successively receive the said printing-forms and to operate with them as primary printing-surfaces; a series of secondary printing-forms adapted to have imposed thereon and to print designs and constructed and designed to fit in accurate preestablished seats in a printing-press, said second transfer-press having an accurate preestablished seat adapted to receive successively said secondary printing-forms; said second transfer-press being provided with means whereby the conveying-surface may be brought into contact with a primary surface to receive an impression and then with a secondary printing-form to impart its impression to the secondary printing-form; and guiding means associated with said second transfer-press whereby a primary printing-surface and a secondary printing-form may be brought into exact cooperating relation both longitudinally and transversely and whereby the design of the primary printing-surfaces may be imposed upon the secondary printing-forms in exact predetermined positions with reference to the subsequent use of said secondary printing-forms as registering printing-surfaces.

27. The combination of a series of rotary supports for printing-forms, identical in working size and shape and constructed and designed to fit in preestablished seats in a printing-press; a series of printing-forms, made of a predetermined size and shape and constructed and designed to removably and replaceably fit on said form-supports in precise predetermined positions, said printing-forms having each a coating of electrodeposited metal suitable to have imposed upon it and to print a design, said coatings being removable from and renewable on the printing-forms without affecting the permanent size and

shape of the latter; a transfer-press provided
with a removable basic surface constructed
and designed to removably fit in an accurate
preestablished seat in said press, said press
5 having also an accurate preestablished seat
adapted to receive successively the printing-
forms and having also an accurate preestab-
lished seat for a basic surface or a series of
basic surfaces; guiding means associated with
10 said press whereby a printing-form and its co-
operating basic surface may be brought at
once into exact predetermined cooperating re-
lation both longitudinally and transversely
and whereby the design of a basic surface
15 may be imposed upon the printing-form in
exact predetermined position with reference
to register; a second transfer-press having an
accurate preestablished seat constructed to
successively receive the said printing-forms
20 and to operate with them as primary print-
ing-surfaces; a series of secondary printing-
forms adapted to have imposed thereon and

to print designs and constructed and designed
to fit in accurate preestablished seats in a
printing-press, said second transfer-press hav- 25
ing an accurate preestablished seat adapted
to receive successively said secondary print-
ing-forms; and guiding means associated with
said second transfer-press, whereby a primary
printing-surface and a secondary printing- 30
form may be brought into exact cooperating
relation both longitudinally and transversely
and whereby the design of the primary print-
ing-surfaces may be imposed upon the sec-
ondary printing-forms in exact predetermined 35
positions with reference to the subsequent use
of said secondary forms as registering print-
ing-surfaces.

In testimony whereof I have affixed my sig-
nature in presence of two witnesses.

EDWARD HETT.

Witnesses:

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