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PATENTED NOV. 28, 1905.

P. V. AVRIL.

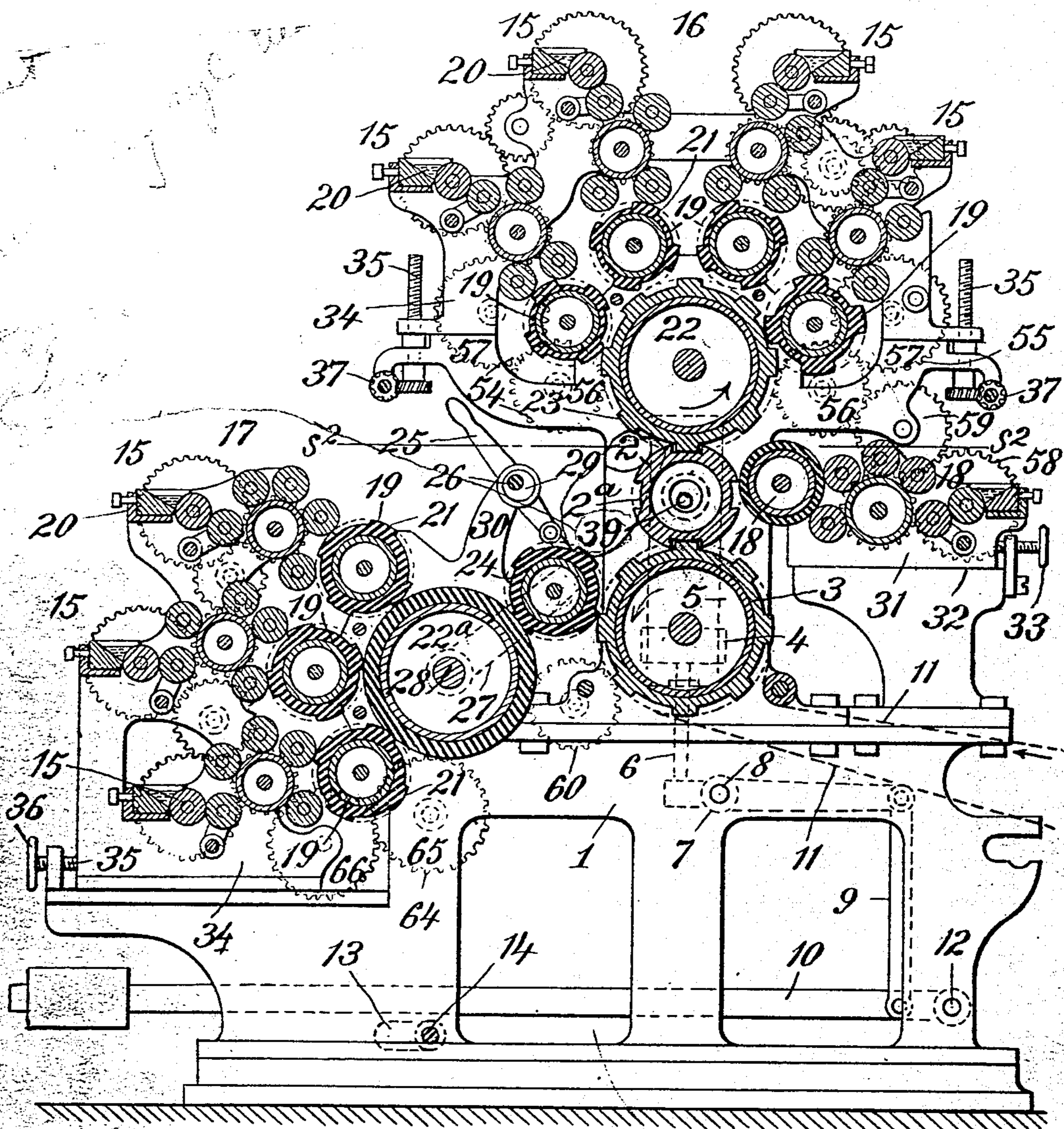
EMBOSSING AND PRINTING MACHINE.

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APPLICATION FILED OCT. 7, 1904.

3 SHEETS-SHEET 1.

FIG. 1.



Witnesses
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Inventor
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1924
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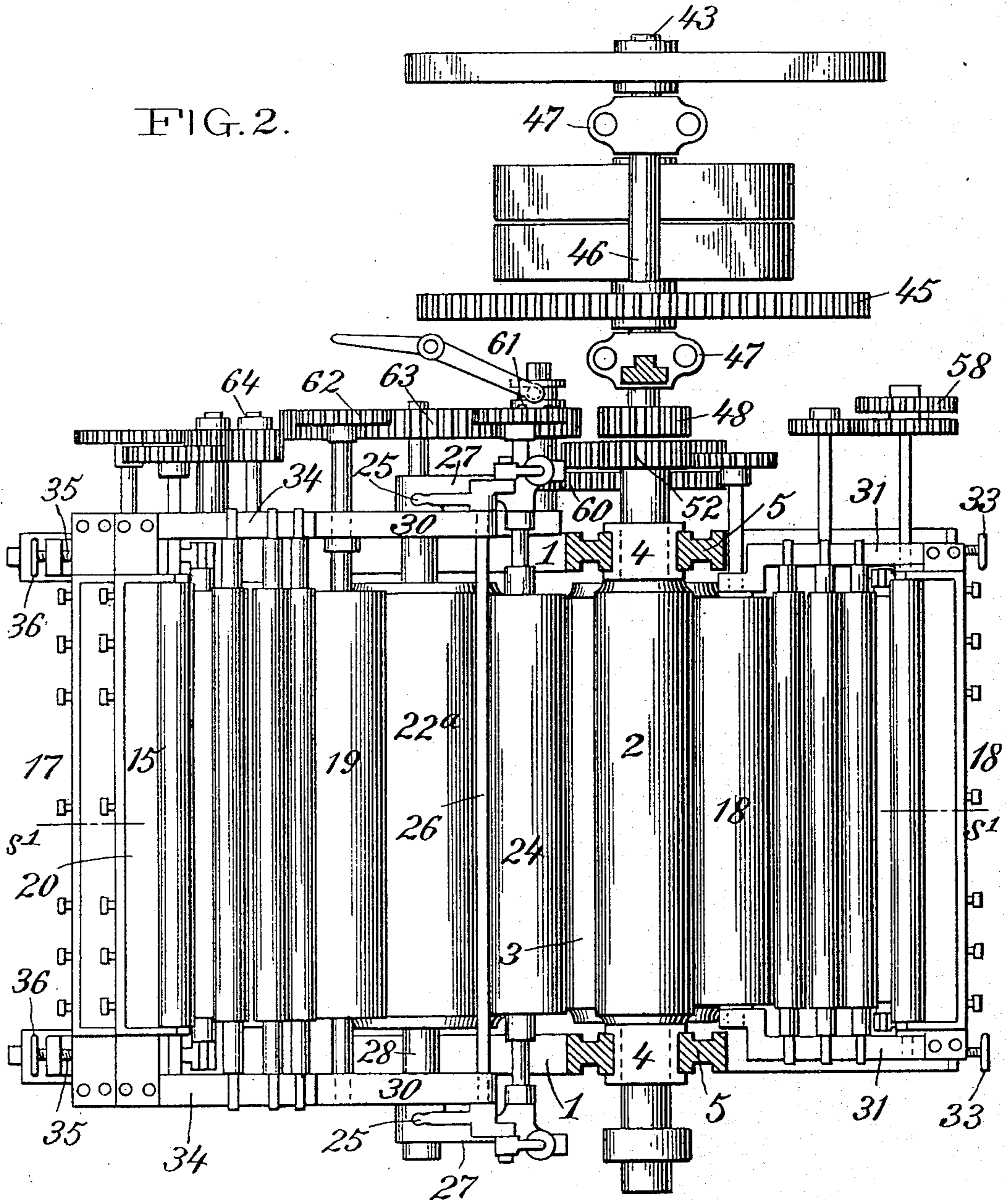
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3 SHEETS—SHEET 2.

FIG. 2.



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3 SHEETS—SHEET 3.

FIG. 3.

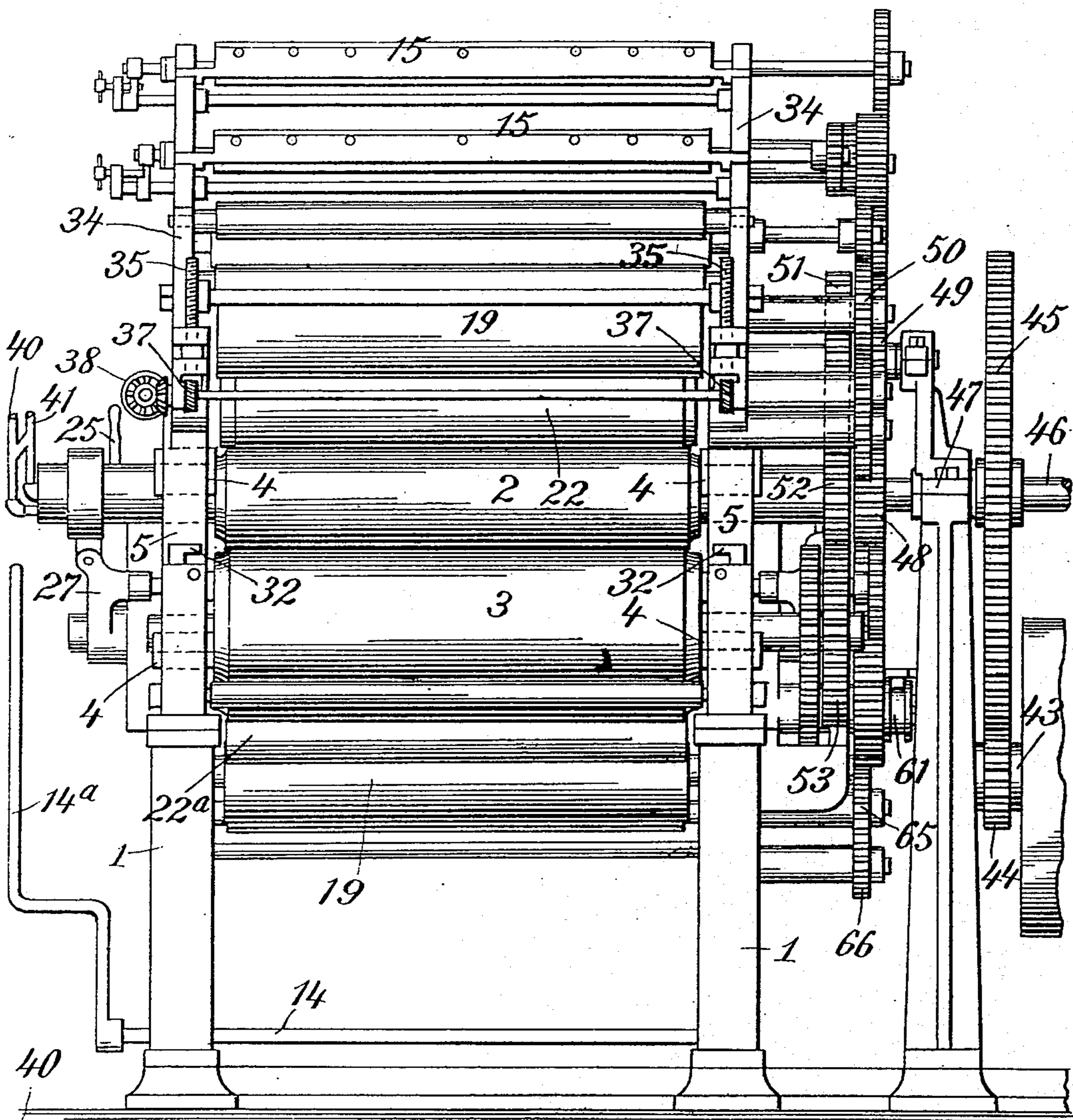
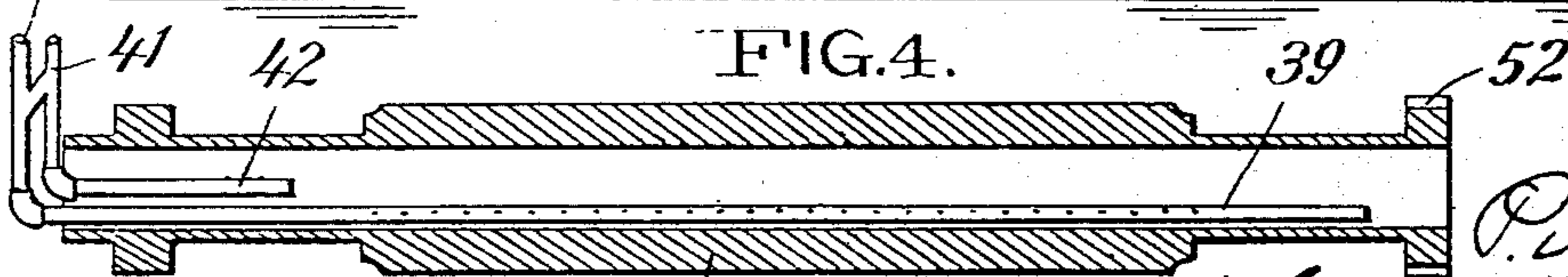


FIG. 4.



Witnesses
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UNITED STATES PATENT OFFICE.

PAUL VICTOR AVRIL, OF PARIS, FRANCE, ASSIGNOR TO MARINIER,
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EMBOSSING AND PRINTING MACHINE.

No. 805,699.

Specification of Letters Patent.

Patented Nov. 28, 1905.

Application filed October 7, 1904. Serial No. 227,573.

To all whom it may concern:

Be it known that I, PAUL VICTOR AVRIL, a citizen of the Republic of France, residing at Paris, France, have invented certain new and useful Improvements in Embossing and Printing Machines, of which the following is a specification.

My invention relates to an embossing and printing machine of a type suitable for producing a continuous impression in colored and embossed effects in a single operation.

The machine embodying my invention is designed to apply one or more colors to a moving sheet and simultaneously emboss the same; further, to intensify, blend, shade, or otherwise modify the color effects by means of superposed colors subsequently applied. I have described mechanism involving this general principle of operation in Letters Patent of the United States, No. 690,822, granted to me January 7, 1902.

An important feature of the present invention consists in mounting the various color-rollers in adjustable relation to the rollers containing either the complete design or any part of it, the object being to permit one set of such design-rollers to be substituted for another containing a different design without the necessity of removing the color-rollers.

A machine suitable for carrying my invention into effect is illustrated in the accompanying drawings. I wish it understood, however, that I do not limit myself to either the construction or arrangement of the mechanism shown, as various changes may be made therein without departing from the spirit and scope of my invention.

In the drawings, Figure 1 is a vertical sectional view of the machine, taken on or about the line $s's'$ of Fig. 2. Fig. 2 is a horizontal sectional view taken on or about the line $s''s''$ of Fig. 1. Fig. 3 is an end elevation; and Fig. 4 is a detail sectional view of the embossing-cylinder, showing the heating means employed in connection therewith.

Referring to the drawings, the frame of the machine is shown as formed of twin side members 1 1, between which are mounted the various rollers making up the embossing and color sets. The embossing set comprises the cylinders 2 and 3, which are mounted in bearings 4 4, movable in guides 5 5 in the side frames. The guides, as shown, are of such

length as to permit only a limited movement of the bearings.

The cylinder 2, which I shall hereinafter term the "embossing-cylinder," is preferably of steel, though it may be formed of other material, if desired, and has cut or engraved upon its surface the design, picture, or other matter to be printed. The machine shown in the drawings is adapted for producing embossed or relief work, and the design or the like is therefore cut into the surface of the embossing-cylinder, as indicated at 2^a in Fig. 1. Intaglio-work may obviously be produced by the substitution of an embossing-cylinder containing upon its surface in relief the matter to be printed.

The cylinder 3, hereinafter termed the "impression-cylinder," is preferably two or three times the diameter of the embossing-cylinder and has formed upon its surface an exact counterpart or relief copy of the design or the like, which is repeated circumferentially thereof as many times as its diameter exceeds the diameter of the smaller cylinder.

The impression-cylinder is preferably formed by winding paper or other material to a suitable depth upon a metal shell, and after being moistened the blank thus prepared is rotated in contact with the embossing-cylinder, which results in impressing the design in the soft paper surface thereof. Upon the evaporation of the moisture the design becomes set or permanent.

Depending from each of the bearings 4 4 of the impression-cylinder there is a rod or projection 6, the lower end of which rests upon the short arm of a lever 7, pivoted at 8, and connected by a link 9 with a weighted lever 10. The arrangement is such as to maintain the impression-cylinder in close contact with the embossing-cylinder and permit it at the same time to yield or become self-adjusting to variations in the thickness of paper or other material (indicated at 11 in Fig. 1) as it passes between the cylinders.

The weighted levers 10 10 are pivoted at 12, and cooperating with each lever there is a cam-like projection 13 upon a cross-shaft 14, which may be rotated by means of a terminal crank 14^a to swing the levers upward and support the same. The weight thus being taken off the cylinders, the bearings thereof will move downward in the guides, permitting separa-



tion of the cylinders and their ready removal, if desired.

It will be observed that the mechanism thus far described will operate to produce a continuous uncolored impression in relief of any design or other matter contained upon the embossing-cylinder, and in order now to apply color to either or both the embossed or plain portions of the sheet I employ a number of color-delivery sets 15, which may be arranged in any convenient manner, but are preferably grouped to form an upper series 16, a lower series 17, and a ground set 18. The colors of the upper series and ground set are first deposited upon the embossing-cylinder, which serves to transfer the same to the sheet as it is embossed. The colors of the lower series are applied directly to the sheet. Coöperating with the various color sets there are a number of transfer-rollers 19, by which the colors are selected and given the required form and arrangement for producing desired effects in the design being printed. As shown, I have provided for the delivery of five colors to the embossing-cylinder and three colors directly to the sheet; but this arrangement is merely a convenient one for purposes of illustration and may be changed, if desired, by increasing or decreasing the number of colors or employing either the upper or lower series with or without the ground set. The particular arrangement and number of rollers in each set is unimportant and may be varied at will, it being essential only to provide for the proper distribution and delivery of color from an ink-fountain, such as 20, to the terminal transfer-roller 19. The rollers 19 are preferably formed or faced with rubber and contain in relief thereon, as indicated at 21, certain elements or figures corresponding to portions of the design upon the embossing-cylinder. Coöperating with the transfer-rollers of the upper series of colors there is a collector-roller 22, upon the surface of which the design is formed in relief, as indicated at 23.

For convenience in grouping the various color sets about the collector-roller it is given a greater diameter than the embossing-cylinder with which it coacts, and the design is in consequence repeated circumferentially thereof, as upon the impression-cylinder above described.

As shown, three colors of the upper series are deposited by the transfer-rollers upon certain of the relief portions of the collector-roller, which in the present instance represents the design, and the fourth or remaining color is deposited upon the depressed surface thereof, representing the ground. From the collector the colors are taken by the embossing-cylinder and applied to the sheet, as above described. In order to intensify, shade, blend, or otherwise modify the colors thus applied, I provide for superposing additional colors

and applying the same either directly to the sheet or indirectly thereon through the medium of the embossing-cylinder. For direct application I employ the lower series of colors 17, which in construction and arrangement is substantially similar to the upper series above described and comprises three color-delivery sets, each terminating in a transfer-roller 19, arranged to deposit color upon a collector-roller 22^a, from which color is taken by a roller 24 and applied directly to the sheet, upon either or both the colored or uncolored portions thereof, after it has passed between the embossing-cylinders.

The function of the roller 24 relatively to the lower series of colors is the same as that of the embossing-cylinder to the upper series, in that both operate between a collector and the impression-cylinder to apply color to the sheet. The roller 24, however, differing from the embossing-cylinder, contains the design or such portions of it as are to appear in the colors of the lower series in relief thereon, and as a result color is applied only to the embossed portions of the sheet. This arrangement permits the use of a smooth-surface collector-roller, as the form and arrangement of the colors transferred are determined by the relief figures or shapes upon the roller 24, and any tendency of the colors upon the collector to spread will therefore not show in the printed sheet. The arrangement of the ground set 18 is such as to indirectly superpose color upon the sheet by depositing the same upon the plain surface of the embossing-cylinder, which receives an additional color from the ground-roller of the upper series, as above described.

The roller 24, controlling the transfer of the lower series of colors to the sheet, is adjustably mounted relatively to the impression-cylinder to permit these colors to be thrown on or off at will while the machine is in operation, and in order to continue the roller in register during such adjustment it is geared and mounted in planetary relation to the collector with which it coacts.

The adjustment of the roller 24 is effected by means of levers 25, which are secured upon opposite ends of a cross-shaft 26. The levers 25 are linked or otherwise connected to arms 27, loosely mounted upon the shaft 28 of the adjoining collector and provided with bearings in which the roller 24 is journaled. The cross-shaft 26 has eccentric enlargements 29 thereon, which are mounted in bearings in extensions 30 of the frame of the machine and serve to hold the levers 25 and the roller 24, connected therewith, in any position of adjustment.

For convenience in adjusting the ground set 18 in and out of operative relation with the embossing-cylinder the various rollers thereof are mounted upon a carriage or mov-

able section 31 of the main frame, which is adjustable in guides 32 by means of screws 33, as shown in Fig. 1.

For the purpose of facilitating the removal of one set of rollers and the substitution of another set containing a different design or the like the color-rollers of the upper and lower series are mounted in movable sections 34 of the main frame and are adjustable by means of screws 35, which may be individually rotated by hand-wheels 36, as shown, in connection with the lower series, or the screws may be connected together by worm-gearing 37 and simultaneously rotated by a wheel or crank 38, as in the upper series. The particular construction and arrangement of the adjustable frame-sections is unimportant, it being essential only to provide a suitable support for the color-rollers during the removal of the rollers containing the design or portions thereof.

Owing to the contraction and expansion of the paper facing of the impression-cylinder and collector-roller of the upper series of colors, there is more or less variation in the outline or distortion of the design thereon, and these cylinders are therefore re-formed or trued up from time to time by applying water or other liquid to soften the surface thereof and rotating the same in close contact with the embossing-cylinder until the moisture evaporates and the surface becomes hard. In order that this may be accomplished without loss of time, I provide means for heating the embossing-cylinder, the effect of which is to dry and harden the surface of these cylinders more rapidly and produce the design thereon in sharper outline.

As shown, the embossing-cylinder is hollow and open at the ends to receive a burner-tube 39, which is supplied with a mixture of gas and air through connections, (indicated at 40 41.) A branch pipe 42 from the air connection supplies air in sufficient quantity to maintain a flow through the cylinder and carry off the gases.

Any suitable gearing may be employed for connecting and driving the various color and embossing rollers and cylinders. As shown, motion from a main driving-shaft 43 is transmitted, through a pinion 44 and gear 45, to a shaft 46, mounted in bearings 47 and carrying a gear 48. Meshing with the gear 48 there is a gear 49 upon the shaft of the collector 22. The several transfer-rollers 19, cooperating with the collector 22, are each provided with a gear 50, meshing with and driven by the gear 49. Adjoining the gear 49 there is a second gear 51 upon the collector-shaft, from which motion is transmitted to the embossing and impression cylinders through intermeshing gears 52 and 53. Two trains of gears 54 and 55, driven from the gear 49, serve to give motion to the foun-

tain and distributor rollers of the color-sets of the upper series. Idlers 56 and 57, included in each of the trains 54 and 55, are mounted, respectively, upon fixed and movable sections of the frame of the machine and, as arranged, move out of mesh and in again as the movable frame-section is raised and lowered. The ground set 18 is similarly driven by a train of gears 58, including idlers 56 and 59, mounted, as above described, to permit the carriage to be moved toward and from the embossing-cylinder.

The collector 22^a of the lower series of colors is driven from the shaft of the impression-cylinder by a train of gears 60, and transmission of power through this train is controlled by a clutch 61. The transfer-rollers 19, which cooperate with the collector 22^a, are each provided with a gear 62, meshing with and driven by a gear 63 upon the shaft of the collector. A train of gears 64, substantially similar to that employed in connection with the color-rollers of the upper series, serves to transmit motion from the gear 63 to the various fountain and distributor rollers of the lower series. Idlers 65 66, forming part of the train 64, permit adjustment of the movable frame-section upon which the color-rollers are mounted.

The operation, advantages, &c., will be apparent from the foregoing description.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An embossing and printing machine comprising requisite embossing members, a series of color-delivery rollers, a cooperating series of transfer-rollers containing figures corresponding with portions of the design upon the embossing members and registering therewith, and means for supporting the delivery-rollers in adjustable relation to the transfer-rollers.

2. An embossing and printing machine comprising requisite embossing members, a series of color-delivery rollers, a cooperating series of transfer-rollers containing raised figures upon the surface thereof which correspond and register with portions of the design upon the embossing members, and means for simultaneously adjusting the various rollers of the color-delivery series relatively to the transfer-rollers.

3. An embossing and printing machine comprising embossing members, a series of color-delivery rollers, a cooperating series of transfer-rollers containing raised figures upon the surface thereof which correspond and register with portions of the design upon the embossing members, a support common to the various rollers of the color-delivery series, and means for adjusting the support.

4. An embossing and printing machine comprising an embossing-cylinder, an impression-

cylinder, a series of color-delivery rollers and transfer-rollers registering with portions of the design upon the embossing-cylinder, a second series of color-delivery rollers and transfer-rollers cooperating with the impression-roller, and means common to each series of color-delivery rollers for supporting the same in adjustable relation to the transfer-rollers with which they coact.

10 5. An embossing and printing machine comprising an embossing-cylinder, an impression-cylinder, a collector upon which colors are deposited, means for maintaining said cylinders and collector in contact under a yielding
15 pressure, and requisite color-delivery and transfer rollers cooperating therewith to produce a continuous impression in embossed and colored effects.

20 6. An embossing and printing machine comprising an embossing-cylinder, an impression-cylinder, bearings for the cylinders movable in guides, pressure-applying means acting upon the bearings in the plane of the axes of the cylinders to yieldingly maintain the latter
25 in contact, and requisite color-delivery and transfer rollers cooperating therewith to produce a continuous impression in embossed and colored effects.

30 7. An embossing and printing machine comprising means for delivering a series of colors,

a collector upon which the colors are deposited, an embossing-cylinder rotatable in contact with the collector, an impression-cylinder, and means for maintaining said cylinders and collector operatively assembled under a yielding pressure. 35

8. An embossing and printing machine comprising requisite embossing members, means for delivering a series of colors, a collector upon which the colors are deposited, a transfer-roller interposed between the collector and one of the embossing members, and means for mounting said transfer member in adjustable relation to the embossing member with which it coacts. 40

9. An embossing and printing machine comprising requisite embossing members, means for delivering a series of colors, a collector upon which the colors are deposited, a transfer-roller interposed between the collector and one of the embossing members, and means for mounting said transfer-roller in planetary relation to the collector with which it coacts. 45

In testimony whereof I affix my signature in the presence of two witnesses.

PAUL VICTOR AVRIL.

Witnesses:

J. E. PEARSON,

FRANK O'CONNOR.