

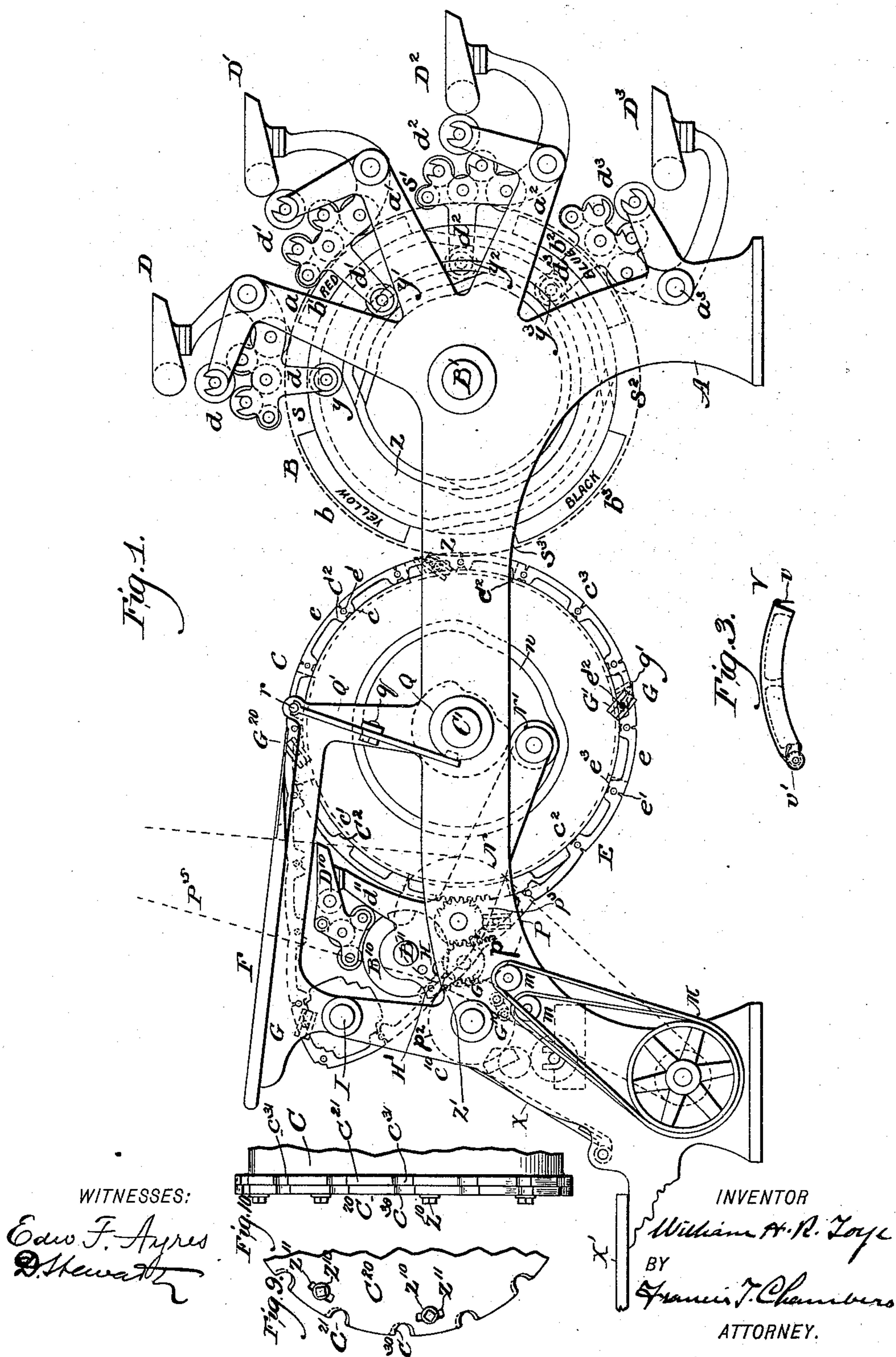
(No Model.)

4 Sheets—Sheet 1.

W. H. R. TOYE.
PRINTING PRESS.

No. 534,302.

Patented Feb. 19, 1895.



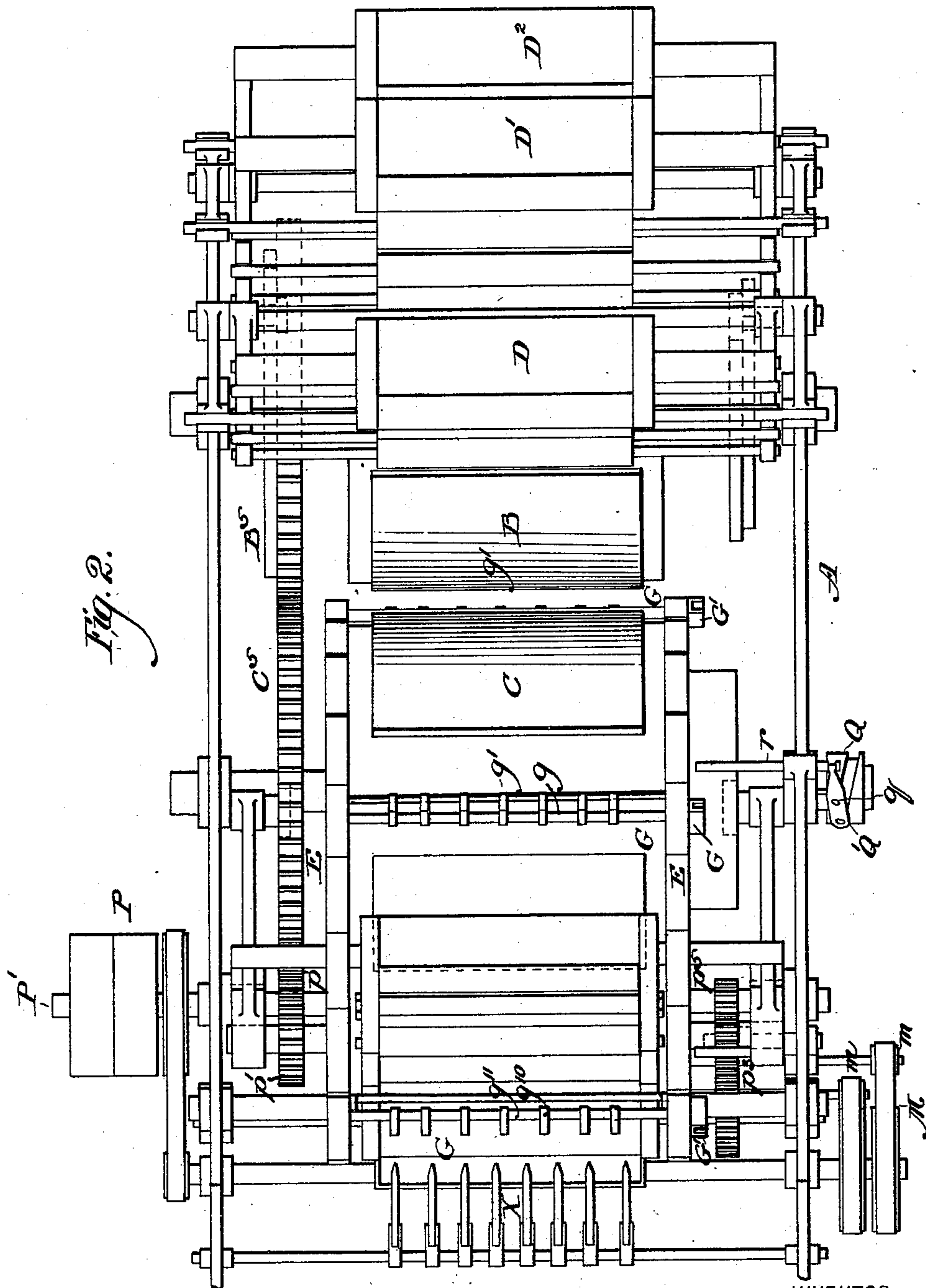
(No Model.)

4 Sheets—Sheet 2.

W. H. R. TOYE.
PRINTING PRESS.

No. 534,302.

Patented Feb. 19, 1895.



WITNESSES:
Edw. F. Ayres
Stewart

INVENTOR
William H. R. Toye
BY
Francis T. Chambers
ATTORNEY.

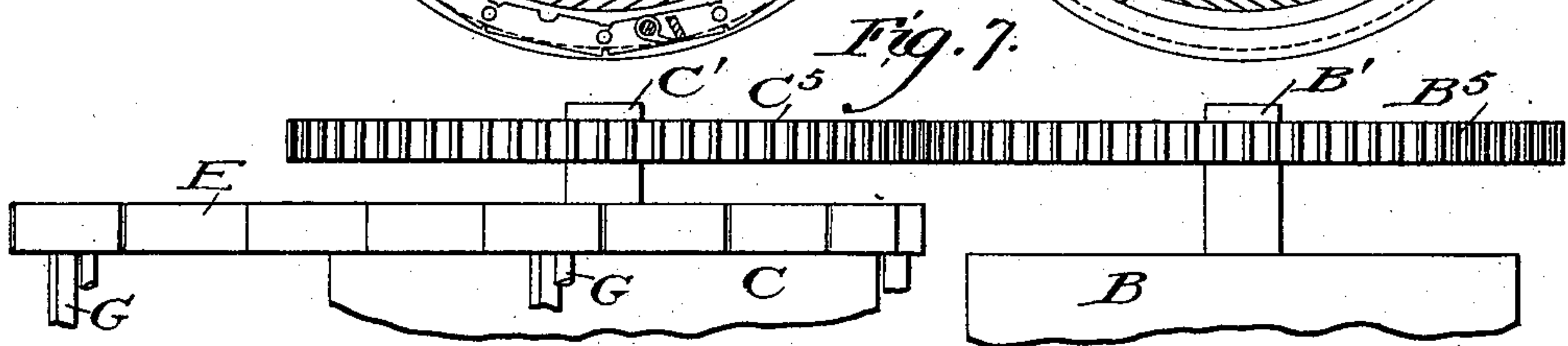
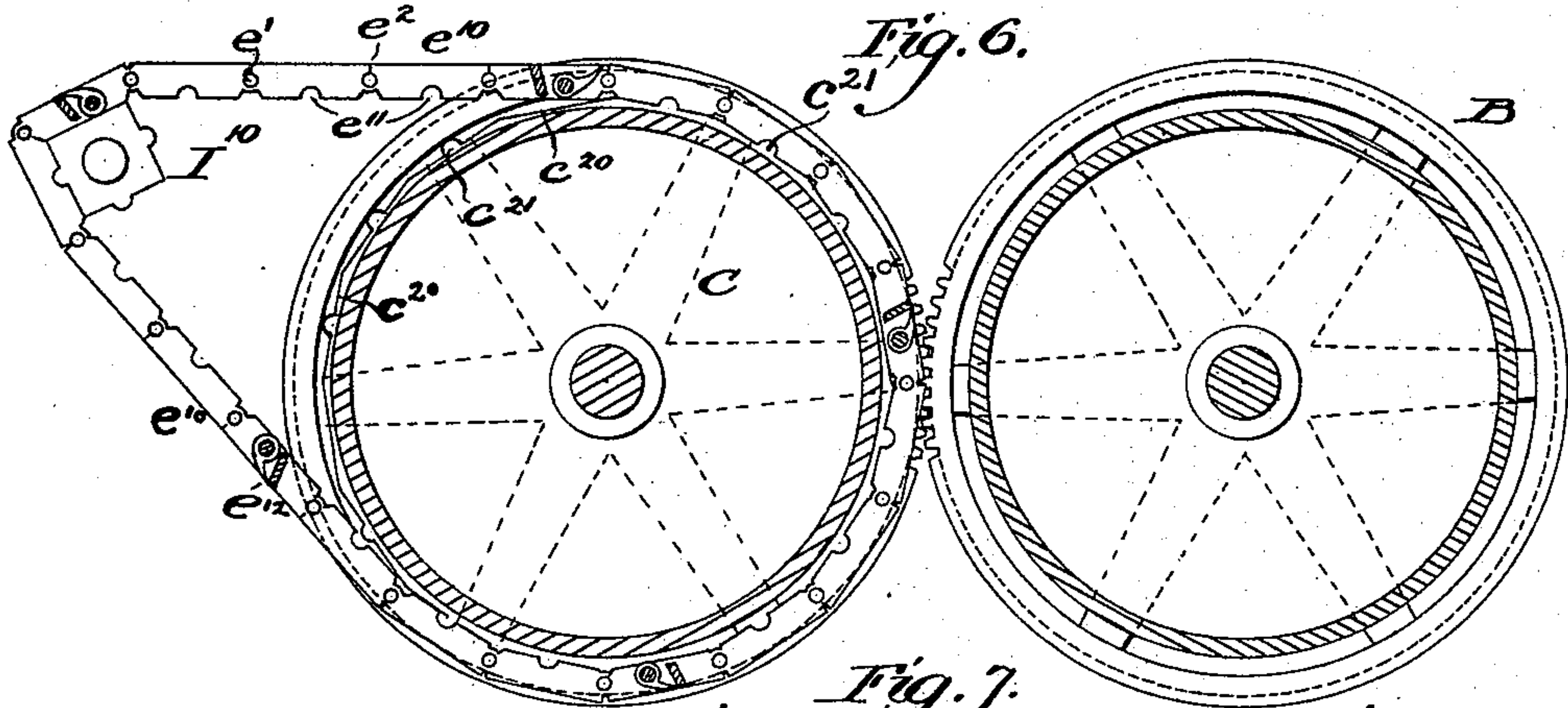
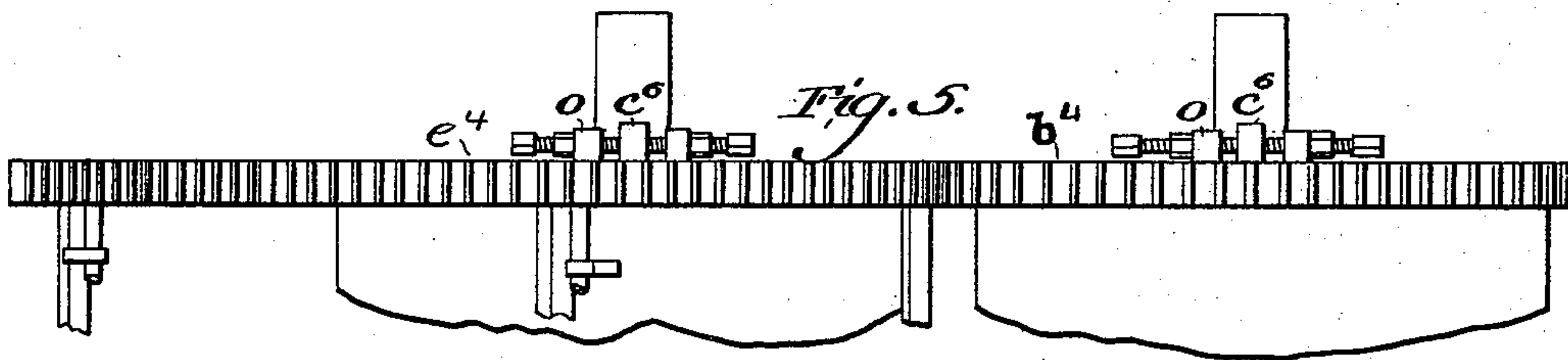
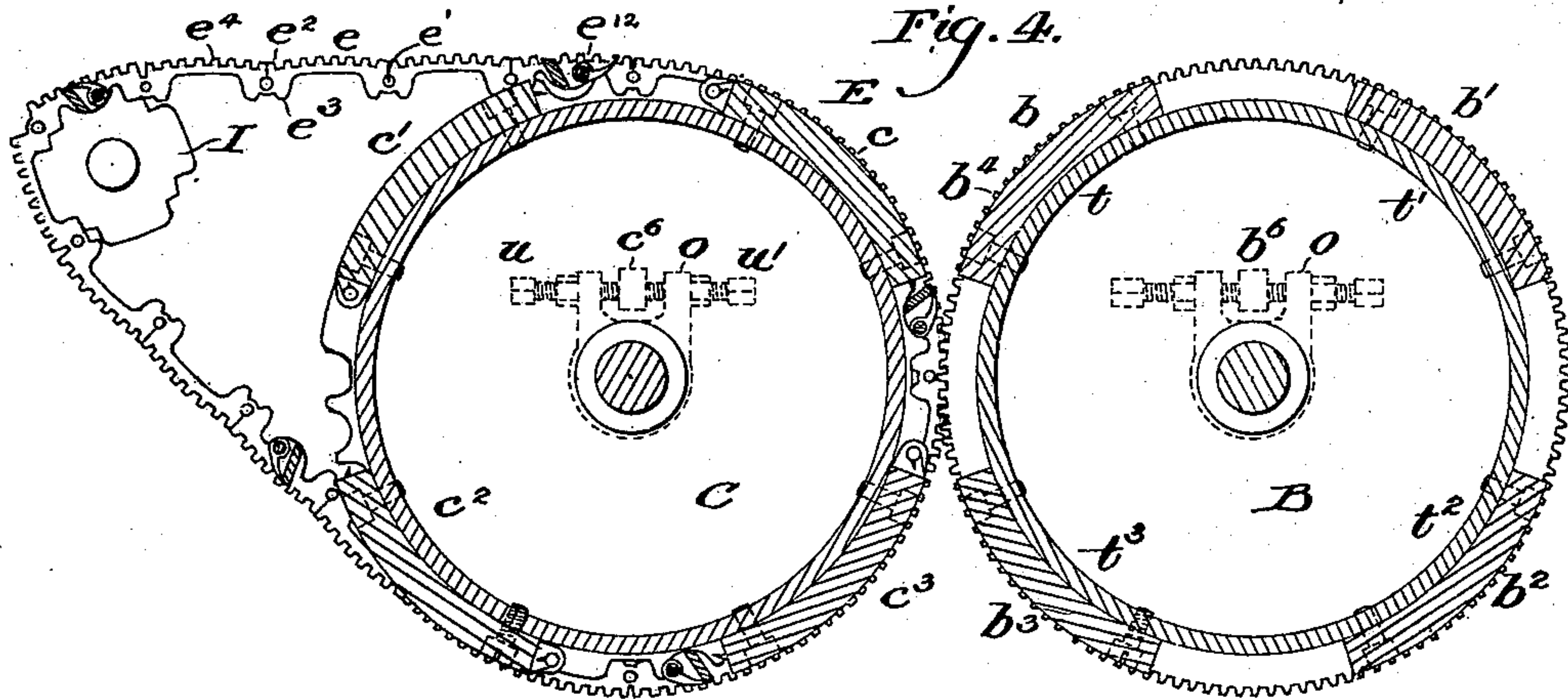
(No Model.)

4 Sheets—Sheet 3.

W. H. R. TOYE.
PRINTING PRESS.

No. 534,302.

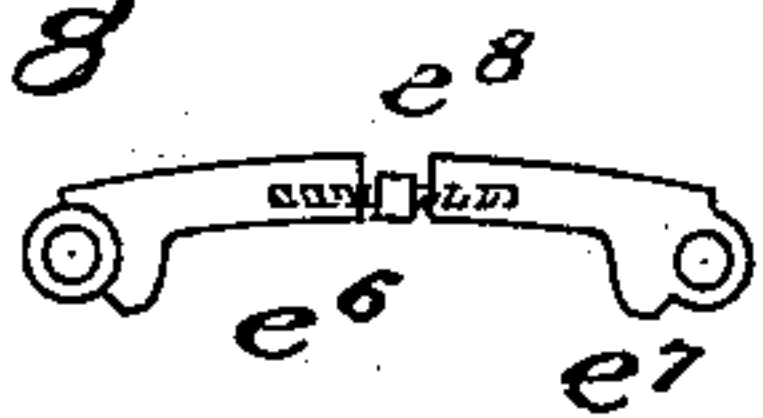
Patented Feb. 19, 1895.



WITNESSES:

Edw. F. Ayres
Attorney

Fig. 8



INVENTOR

William H. R. Toye

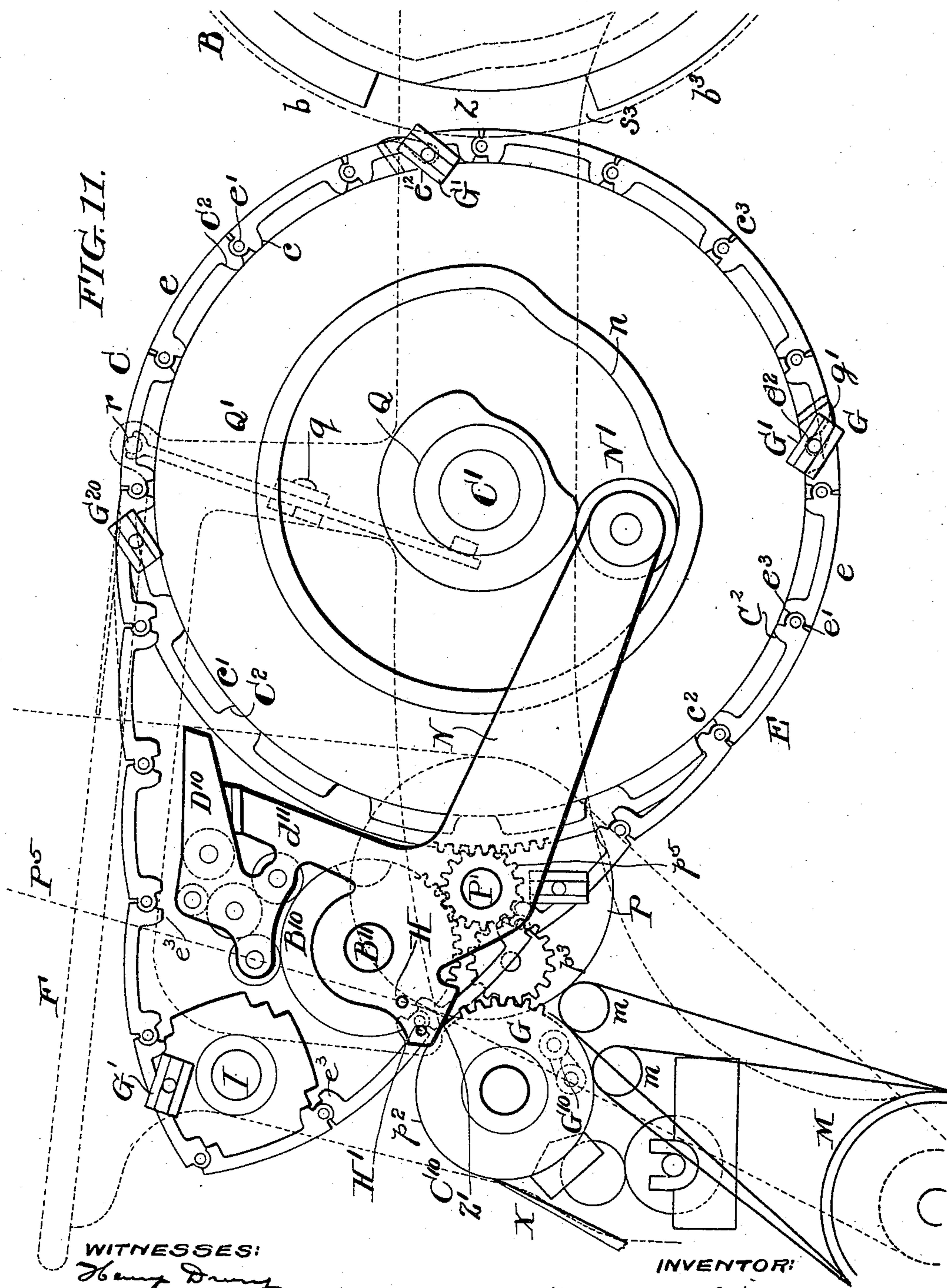
BY

Francis T. Chambers
ATTORNEY.

W. H. R. TOYE.
PRINTING PRESS.

No. 534,302.

Patented Feb. 19, 1895.



WITNESSES:
Henry Denny
Edw. T. Ayres.

INVENTOR:
William H. R. Toye
by his atty.
Francis T. Chambers

UNITED STATES PATENT OFFICE.

WILLIAM H. R. TOYE, OF PHILADELPHIA, PENNSYLVANIA.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 534,302, dated February 19, 1895.

Application filed April 10, 1893. Renewed January 4, 1895. Serial No. 533,821. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. R. TOYE, a citizen of the United States, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a new and Improved Printing-Press, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to printing presses and has particular reference to presses which are adapted to print pictures in colors, where exact and careful register is required. It is well known to those skilled in the art of color printing that one of the greatest difficulties to overcome in this class of work is lack of perfect register. Various systems have been devised and many machines made to obviate this great difficulty, but these machines have heretofore been imperfect in many respects and generally involved great cost in their construction.

The main object of my invention is to provide a press of comparatively simple construction capable of printing in colors on one or both sides of a sheet, and which has great accuracy of register.

To this end my invention mainly consists in providing a printing couple, whose type cylinder is divided into a number of segmental forms, and whose impression cylinder is divided into a corresponding number of segmental impression surfaces, with an endless flexible carrier of greater length than the circumference of the cylinders, so that, as it revolves with the impression cylinder it will retard the sheet at each revolution and cause it to be printed on by a different set of types; and it also consists in various other improvements in this style of press which will be hereinafter specifically pointed out in the claims appended to this specification.

My invention can best be explained in connection with the drawings in which it is illustrated, and in which—

Figure 1 is a side elevation of a multicolor printing press constructed according to my invention. Fig. 2 is a plan view of the press shown in Fig. 1. Fig. 3 is a view of the removable platen turtle. Fig. 4 is a side view of the main printing couple showing the flexi-

ble carrier more clearly than shown in Fig. 1, the driving mechanism and frame being removed. Fig. 5 is fragmental plan view of the press shown in Fig. 4. Fig. 6 is a view similar to that shown in Fig. 4, illustrating a modified form of carrier. Fig. 7 is a fragmentary plan view of the press shown in Fig. 6. Fig. 8 is a side elevation of one of the links shown in Fig. 4, showing the adjusting device. Fig. 9 is a fragmentary side view; Fig. 10, a top view of a device taking up for wear in the link carrier; and Fig. 11 is a view on an enlarged scale of the portion of the press to the left of the shaft C', the main frame of the machine being shown in dotted lines.

A represents a frame on which are journaled or otherwise properly secured the various gears, rolls and levers which go to make up the press.

B and C are respectively the impression and the type cylinders, and in this construction the two cylinders are divided into as many segmental sections as there are printing colors to be printed. It is evident that any number of divisions could be made but the press as shown has four divisions and is adapted to print any four printing colors as yellow, red, blue and black.

The type cylinder B is divided into four divisions marked $b\ b'\ b^2\ b^3$, suitable spaces $s\ s'\ s^2\ s^3$ being left between the several type sections for the accommodation of the gripper mechanism in a manner well understood.

On arms as $a\ a'\ a^2$, and at a^3 on the frame A of the press are pivoted frames $d\ d'\ d^2\ d^3$ carrying sets of inking rolls $D\ D'\ D^2\ D^3$. These frames carry at $y\ y'\ y^2\ y^3$ rollers which work in suitable push and pull cams marked z in the face of the cylinder B and operate in a well known way to ink the proper sections of type on each revolution of the cylinder B.

As more clearly shown in Fig. 4 the several sections of the cylinder B are provided with removable turtles $t\ t'\ t^2\ t^3$ secured in any convenient manner as by bolts and on these the usual blocks and plates are secured in a manner perfectly well known.

The platen or impression cylinder C is divided into as many sections $c\ c'\ c^2\ c^3$ as is the type cylinder, and these sections I also pref-

erably provide with removable make ready or platen turtles, one of which is shown removed in Fig. 3.

The cylinder C is provided with suitable gear C² in which mesh gear arranged on the flexible carrier E. The flexible carrier may consist of a chain or belt, strips of steel or any other suitable flexible material, but I prefer to make the carrier of a series of links pivoted together. As shown in Fig. 1 this carrier E consists of a series of curved links *e*, pivoted at *e'* and carrying at *e*¹² the gripper mechanisms which consist of gripper bars as *g* having fingers *g'* and tripping cams G'. The separate links are provided with internal gear teeth as *e*³ where the two links are pivoted together, which teeth are adapted to engage with the gear C² on the cylinder C. No outside gear teeth are formed on the links as shown in Fig. 1 but the two cylinders B C are secured to shafts as B' C' and gear wheels B⁵ C⁵ are arranged as best shown in Fig. 2 whereby the two cylinders may be driven in unison. In Fig. 4 the various links are provided with internal gear *e*³ and also with external teeth *e*⁴ which are adapted to mesh with gear teeth *b*⁴ on the cylinder B and serve to drive this cylinder. In this construction the external gears B⁵ C⁵ may be discarded. This flexible rack or carrier may be composed if desired of straight links as shown in Fig. 6. Here the separate links *e*¹⁰ are pivoted as before at *e'* and are provided with gears at *e*¹¹, but they are not curved and so the cylinder C is made with polygonal surfaces as shown at *c*²⁰ to support the flexible rack there shown. Gears as *c*²¹ are arranged to gear with the gears *e*¹¹.

To return to the press shown in Fig. 1 the carrier E is supported by a pulley of suitable contour as I, preferably placed as shown behind the cylinder C.

B¹⁰ is a second type cylinder arranged to print on the side of the sheet not printed by the type on the cylinder B. This is best shown in Fig. 11. This cylinder is pivoted at B¹¹ and driven from the main shaft P' by means of gears *p p'* as best shown in Fig. 2, and a corresponding impression cylinder C¹⁰ is also driven from the main shaft P' by means of gears *p⁵ p³* and is provided with gripper mechanism at G¹⁰. In order to bring the type cylinder B¹⁰ to such a position that it will print at proper times in a manner to be explained hereinafter, a lever arm N oscillated by means of a roller N' which reads the cam *n* in the face of the cylinder C is arranged as shown in Figs. 1 and 11. This arm is pivoted on the main shaft P' and carries at B¹¹ the type cylinder B¹⁰ and also the inking rolls D¹⁰ therefor on an arm *d*¹¹, and suitable pins H H' are arranged substantially as shown below the pivotal point of the cylinder B¹⁰ and serve to tumble the cams G' and G¹¹ in a manner to be explained. Suitable set-offs operated from a pulley M driven from the main shaft are shown at *m m* and serve to clean the cylinder C¹⁰.

X are fly fingers driven in any suitable manner and X' is the receiving board.

The links *e* of the flexible rack when not provided with external gear teeth are preferably arranged as shown in Fig. 8 where the link is made in two parts *e*⁶ and *e*⁷ a right and left hand screw *e*⁸ being arranged and shown to adjust the length of the link. It is evident however that various other ways of arranging the link so as to be longitudinally adjustable might be devised and I do not wish to be limited to the precise construction shown. The carrier may be composed entirely of such links, or one or more may be arranged where most useful.

The cylinders B and C are preferably arranged so as to be adjustable on their respective shafts B' and C'. As shown in Fig. 4 a yoke as O is secured to the shaft and a projection as *c*⁶ or *b*⁶ on the cylinders C and B respectively is adjustably held between screws *u u'*. In the construction shown in Figs. 9 and 10 the cylinder C is provided at each end with heads C²⁰ C²¹ connected together by bolts *z*¹⁰ working in slots *z*¹¹. The heads C²⁰ C²¹ have recesses *c*³⁰ *c*³¹ respectively arranged in their rims to engage with teeth *e*³ in a manner corresponding to the recesses C² already described. By setting one head C²⁰ slightly ahead of its fellow, wear may be taken up and the rack kept tight while rotating with the cylinder C. By this arrangement the alignment will be kept perfect even if there may be some slack in the rack between the cylinder C and the supporting pulley I. A cam Q is arranged on the shaft C' and serves to operate a lever Q' which is conveniently pivoted at *q* and operates a pin as *r*. The cam is so arranged that it will put the pin *r* in operative position once at every rotation of the cylinder C which is once at every rotation of the complete number of printing and impression sections.

The carrier E is of such a length that there is room for one more set of gripper mechanisms than there are sections on the type and impression cylinders, that is to say, in the construction shown, the length of the carrier is five-fourths the circumference of the cylinders C and B, so that on the rotation of the cylinder C and the carrier E any set of grippers will be retarded exactly one-fourth of a circumference or one section behind the place where it was on the previous rotation of the cylinder.

The operation of the machine shown in Figs. 1 and 2 is as follows: Power is applied to the shaft P' through a pulley as P and a suitable belt as P⁵. From this shaft motion is transmitted to the gears C⁵ B⁵ through the spur *p* thus rotating the cylinders C B. Motion is also transmitted to the cylinder B¹⁰ by means of the gears *p p'* and to the impression cylinder C¹⁰ by means of the gears *p⁵ p³*. Suitable inks being placed in the fountains D D' D² D³ and D¹⁰ the operator presents a sheet at the edge of the feed board F to the gripper mech-

anisms G. Supposing that the machine has been running, the action can best be understood by following the course of a sheet presented to a set of grippers shown at G²⁰ just at the edge of the feed board. By the time that this sheet has arrived at the point Z where an impression is printed thereon, the section b' of the impression cylinder will have come around in the rotation of the cylinder B and the first color which will be printed on the sheet will be red. The sheet having received its first impression is carried along by the flexible carrier being of course succeeded by another sheet and is carried around the supporting pulley I and back under the front of the feed board F. In its path it passes between the rolls B¹⁰ C¹⁰ but the type cylinder B¹⁰ is held out of engagement with the cylinder C¹⁰ and out of the path of the sheet carried by the grippers by the action of the cam n and arm N. When the sheet has arrived under the front of the feed board the pin r being out of operation as described, the sheet is passed on to the point Z to receive another impression. The retardation caused by the additional length of the carrier E as described above causes the sheet when again it arrives at the point Z to be opposite the section b² which carries a set of plates which are arranged to print in blue. Being again carried around, the sheet receives the black and lastly it receives a yellow impression from the type or plates on the section marked b. As the gripper mechanism carrying the sheet now fully printed on one side arrives at the point marked Z' the cam n in the face of the cylinder C operates as described to bring the type cylinder B¹⁰ to a position where it will be ready to print the side of the paper not already printed on. As the cylinder B¹⁰ is placed in position the pins H H' carried by the arm N as shown are put in line with the respective tumbler cams G' G¹⁰ and operate to cause the grippers which seized the sheet at G²⁰ to release the sheet and to cause the fingers of the gripper mechanism G¹⁰ to seize it. The sheet is carried now by the impression cylinder C¹⁰ and is printed on the back by the plate cylinder B¹⁰. When properly printed the sheet is released from the clutch of fingers G¹⁰ and is caught by fly fingers X and dropped on the receiving board X' in a manner well understood. The gripper mechanism G²⁰ continues its travel, comes around to the position just under the front of the feed board F where it is tumbled by the pin r and seizes and carries along a new sheet to be printed on. It will be noticed that the line of travel of the sheet while it is being printed on and during such time as any part of the sheet is being printed on is exactly parallel to the surface of the impression cylinder.

The turtles of the plate or type cylinder are removable in the usual manner and for convenience I also form the impression cylinder with removable platen turtles. As seen in Fig. 3, V represents such a turtle. v is a small spur over which the sheet or make ready sur-

face is hooked and v' represents a small ratchet wheel to which is connected a roller for tightening said sheet.

I have described my press as capable of printing in four colors but by properly arranging the printing plates so that portions thereof will print on parts of the sheet printed on by another plate so as to print one color on another, various other colors can be obtained. For instance by printing yellow on blue green will result, red on blue will cause violet and red and yellow will cause orange and by otherwise combining the tints a neutral tint will appear.

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

1. In a printing machine, the combination with a type cylinder having a number of segmental forms, of an impression cylinder having as many segmental impression surfaces as there are forms on the type cylinder, an endless flexible carrier of greater length than the circumference of the cylinders revolving with the impression cylinder, and gripper mechanism secured to said flexible carrier, whereby the sheet carried by the gripper mechanism on the carrier will be carried in a path substantially parallel to the periphery of the impression surface during such time as it is being printed on.

2. In a printing machine, the combination with a type cylinder having a number of segmental forms, of an impression cylinder having as many segmental impression surfaces as there are forms on the type cylinder, gripper mechanisms one more in number than the number of the segmental impression surfaces, and an endless flexible carrier, of a length whose ratio to the circumference of the cylinder is the same as the ratio of the number of gripper mechanisms to the number of segmental forms and impression surfaces, said carrier revolving with the impression cylinder and adapted to support the gripper mechanisms.

3. In a printing machine, the combination with type and impression cylinders revolving in the same time and divided into an equal number of segmental sections for plates and impression surfaces respectively, of a flexible rack revolving with the impression cylinder and composed of pivoted links and a series of gripper mechanisms carried at intervals by certain of said links.

4. In a printing machine, the combination with a type and an impression cylinder revolving in the same time and divided into an equal number of segmental sections for plates and impression surfaces respectively, of a flexible carrier borne by a support of similar curvature to the impression cylinder, said carrier being composed of a series of curved links whose curvature is similar to that of the support, said links being pivoted together, and a series of gripper mechanisms carried at intervals by certain of said links.

5. In a printing machine the combination with a type cylinder having a number of segmental forms, of an impression cylinder having as many segmental impression surfaces as there are forms on the type cylinder, a flexible rack adapted to revolve with the impression cylinder and having internal gear arranged to mesh with the gear or mechanism for driving it, mechanism for driving said rack and a series of gripper mechanisms carried by said rack.

6. In a printing machine the combination with a type cylinder having a number of segmental forms, of an impression cylinder having as many segmental impression surfaces as there are forms on the type cylinder, a flexible rack composed of separate links curved to correspond to the wheel which drives the rack, said rack being adapted to revolve with the impression cylinder and having internal gear arranged to mesh with the gear or mechanism for driving it, mechanism for driving said rack and a series of gripper mechanisms carried by said rack.

7. In a printing machine the combination with a type cylinder having a number of segmental type sections, an impression cylinder having as many segmental impression surfaces as there are type sections on the type cylinder, means for rotating both cylinders in unison, a flexible carrier of greater length than the circumference of the cylinders driven by the impression cylinder and a series of gripper mechanisms, one more in number than the number of segmental impression surfaces carried by the rack.

8. In a printing machine the combination with a type and an impression cylinder rotating in equal times and divided into a number of segmental sections for plates and impression surfaces respectively, of a flexible carrier rotating with the impression cylinder, and of greater length than the circumference of the cylinders, a series of gripper mechanisms, one more in number than the divisions of the type cylinder, carried by said flexible carrier and means for tripping said gripper mechanisms after the sheet carried thereby has received an impression from the plates or types on each division of the type cylinder.

9. In a printing machine the combination with a type and an impression cylinder divided into a number of segmental divisions for plates and impression surfaces respectively, of a flexible carrier of greater length than the circumference of the cylinders provided with gripper mechanism adapted to carry the sheet to be printed between the type and impression surfaces and a second printing couple adapted to print on the side of the sheet left blank by the first printing operation.

10. In a printing machine the combination with a type and an impression cylinder divided into a number of segmental divisions for plates and impression surfaces respectively, of a flexible carrier of greater length than the circumference of the cylinders carried and driven by the impression cylinder, and provided with gripper mechanism operating to carry the sheet to be printed between the type and impression surfaces, a second printing couple adapted to print on the side of the sheet left blank by the first printing operation the type cylinder of which is adapted to be moved to and from the path of the sheets to be printed and means for so moving said cylinder at proper times.

11. In a printing machine the combination with a type and an impression cylinder divided into a number of segmental divisions for type and impression surfaces respectively, of an endless flexible carrier of greater length than the circumference of the cylinders provided with gripper mechanism adapted to carry the sheets to be printed between the type and platen surfaces, a second type cylinder arranged so as to be movable to and from the path of the sheets to be printed, means for so moving the cylinder at proper times, an impression cylinder and a system of set off for the impression cylinder.

12. The combination with a printing machine of an endless flexible carrier adapted to convey blanks to be printed between the rolls of the printing couple; said carrier being composed of separate links, each link being composed of two parts and means for securing the parts together and adjusting their length substantially as described and so that the length of the carrier may be changed to adapt it to varying conditions of the temperature, strain, and so on.

13. In a printing machine the combination with a type and an impression cylinder of heads as $C^{20} C^{21}$ on the impression cylinder recesses $c^{30} c^{31}$ in the heads $C^{20} C^{21}$ respectively, and means for adjusting said heads circumferentially relative to each other and a carrier having gear adapted to mesh in the recesses in the heads substantially as and for the purpose specified.

14. In a printing machine the combination with type and impression cylinders, of a carrier rotating with the impression cylinder and composed of pivoted links curved to correspond to the curvature of the impression cylinder and gripper mechanism carried by the carrier.

WILLIAM H. R. TOYE.

Witnesses:

ALF. H. FABER,
EDW. F. AYRES.