

4 Sheets—Sheet 1.

No. 453,773.

Patented June 9, 1891..

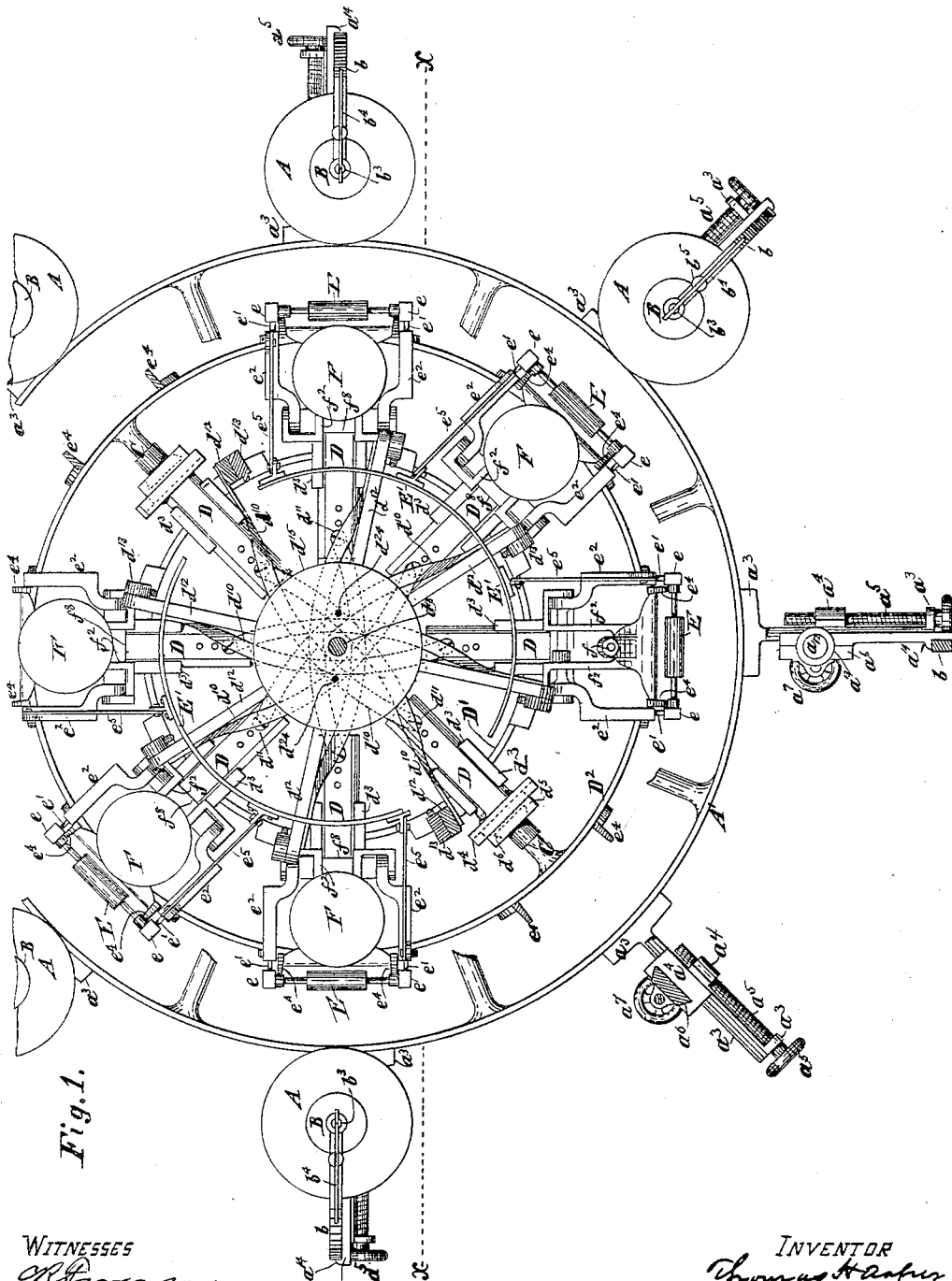


Fig. 1.

WITNESSES

CR Ferguson
Wm M. Cliff

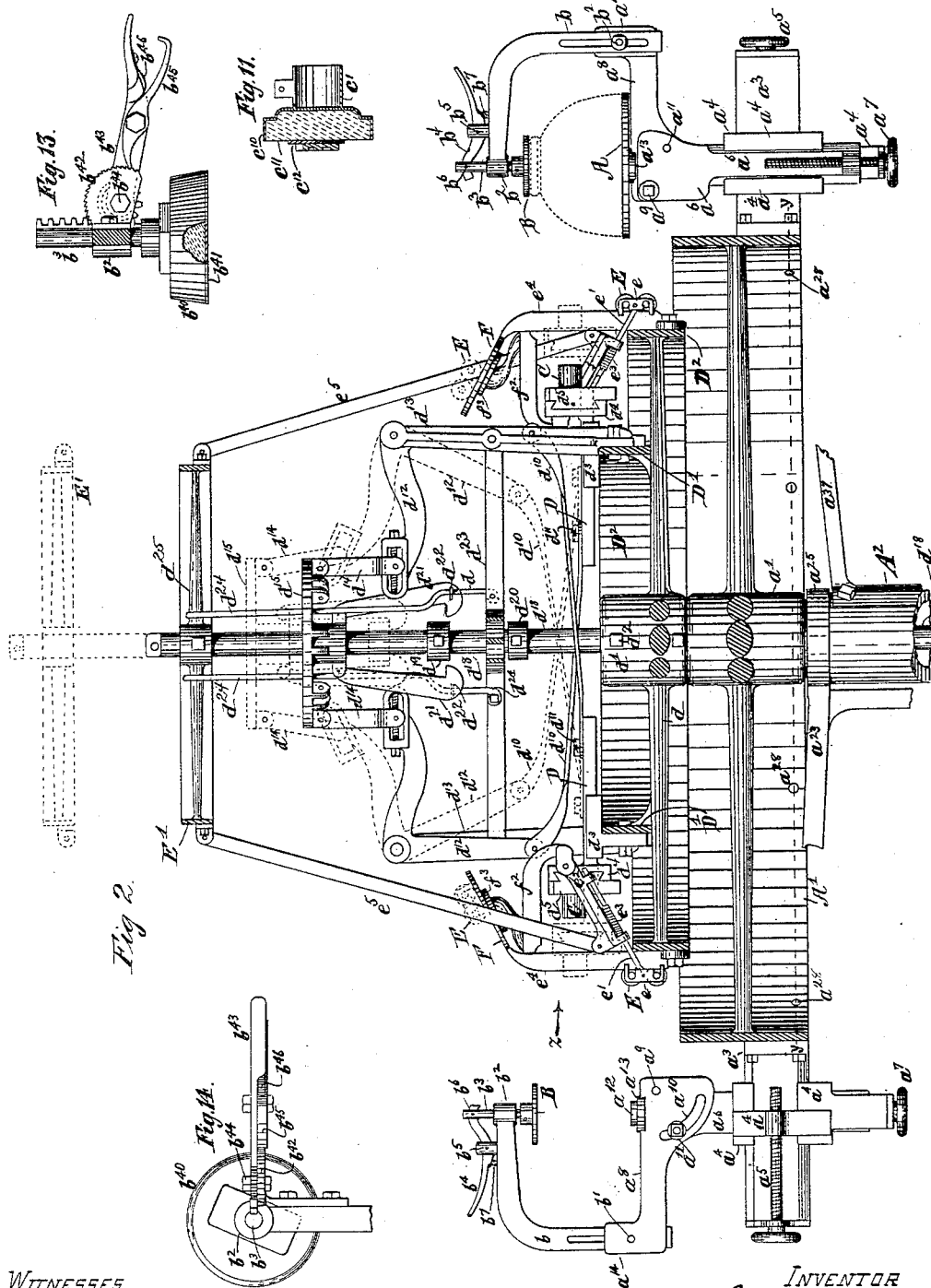
INVENTOR

Thomas H. Cooper
By his attorney
Edwin H. Brown

T. HARPER.
PRINTING MACHINE.

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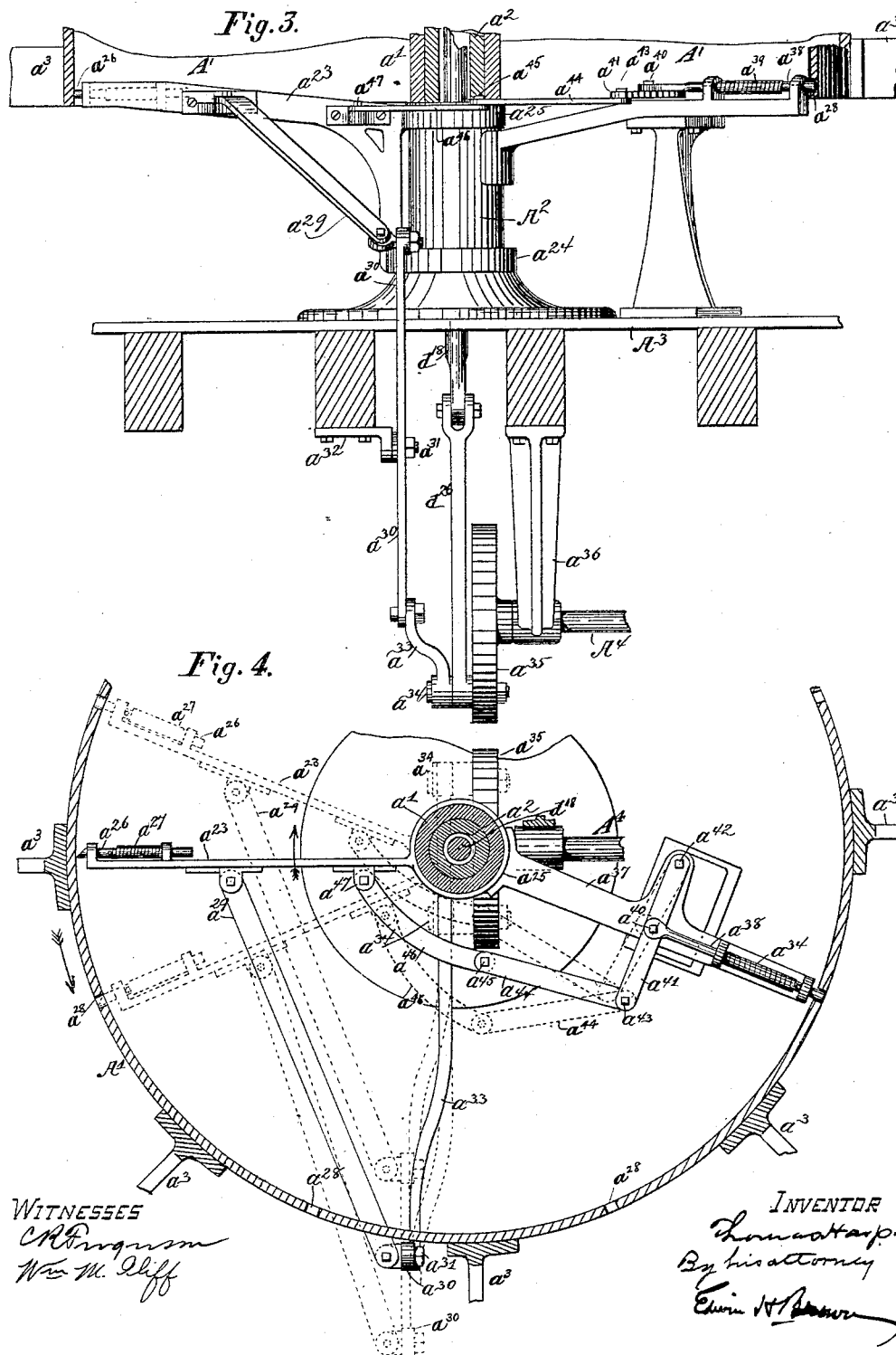
INVENTOR

Thomas Harper
By his attorney
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UNITED STATES PATENT OFFICE.

THOMAS HARPER, OF WESTCHESTER, ASSIGNOR TO JOHN HARPER, OF
BROOKLYN, NEW YORK.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 453,773, dated June 9, 1891.

Application filed August 20, 1890. Serial No. 362,500. (No model.)

To all whom it may concern:

Be it known that I, THOMAS HARPER, of Westchester, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in Printing-Machines, of which the following is a specification.

This improvement is especially designed for successively printing upon articles having curved surfaces, such as lamp-shades, articles of sheet metal, and the like, but is applicable to the printing of flat surfaces.

I will describe a machine embodying my improvement, and then point out the novel features in the claims.

In the accompanying drawings, Figure 1 is a top view of a machine embodying my improvement, with certain parts omitted and others represented in section. Fig. 2 is a vertical section of the same, taken substantially at the plane of the dotted line *xx*, Fig. 1. Fig. 3 is a vertical section taken substantially in the same plane as Fig. 2, and illustrating the lower part of the machine not included in Fig. 2. Fig. 4 is a horizontal section taken at the plane of the dotted line *yy*, Fig. 2. Fig. 5 is a view of certain parts which operate for printing, as seen when looking in the direction indicated by the arrow *z*, Fig. 2. Fig. 6 is a vertical section taken at the plane of the dotted line *ww*, Fig. 5. Fig. 7 is a top view of a plate forming a support for an article upon which printing is to be done and certain appurtenances for operating the same. Fig. 8 is a sectional side elevation of parts represented in Fig. 7. Fig. 9 is a vertical section of certain parts which contribute to impart movement to the type. Fig. 10 is a view of the outer side of said parts, or, in other words, a view representing them as they would be seen when looking in the direction of the arrow *v*, Fig. 9. Fig. 11 is a longitudinal section of a type. Fig. 12 is a side elevation of parts of modified construction for inking the types. Fig. 13 is a side view of parts of modified construction for holding articles to be printed. Fig. 14 is a top view of the parts shown in Fig. 13.

Similar letters of reference designate corresponding parts in all the figures.

Before attempting a detailed description of

the parts comprised in the machine which I have illustrated I will attempt to give a general explanation of the principal parts and their movements and operations.

A designates a number of plates or beds forming supports for articles upon which printing is to be done. In the present instance they are particularly adapted for supporting glass lamp-shades. I have represented such a shade in dotted outline in Fig. 2. Combined with these supports A are holders B, which are intended to rest upon the articles to be printed and retain them upon the supports. It will be seen that the holders are in the present machine located above the supports. They are sustained by a frame which is susceptible of a rotary movement for the purpose of revolving the articles to be printed opposite to a number of separate types supported by type-holders C, so that successive impressions may be made upon the articles to be printed. The supports A will preferably also be made capable of a rotary movement, so as to afford provision for presenting to the type different portions of the surfaces of articles to be printed. When this provision is made the holders B will be made capable of a similar movement. It will be also advantageous to render the supports A capable of adjustment up and down toward and away from the type, and at different angles to the horizontal, for in this way articles of different sizes and shapes may better be presented to the types.

The holders B will preferably be made adjustable toward and away from the supports A for the accommodation of articles of different sizes.

The types used will have a flexible surface which may be flattened to facilitate inking, and nevertheless can be bent to conform to the curved surface of a convex article in printing.

The type-holders are arranged in a circular row, and are made capable of a reciprocating movement radially to the circle in which they are arranged to enable them to move to and from articles resting upon the supports A. They are supported upon carriers D in such manner as to admit of their being adjusted up and down and sidewise. They may also

be adjusted longitudinally toward and from the supports A by varying the points of connection between their carriers and rods which reciprocate the latter.

5 Combined with the type are inking-rollers E, inking-tables F, and appurtenances, whereby the inking-rollers may be caused to run over the inking-tables and afterward traverse the faces of the types.

10 Having now, as I think, fully explained the nature, movements, and operations of the principal parts of the machine illustrated in the drawings, I will describe these parts and their appurtenances in detail.

15 A' designates a rotary frame with which the supports A are connected and by which they are revolved. This frame has a tubular hub a' , which fits upon a tubular boss a^2 formed at the upper end of a standard A². (See particularly Fig. 3.) This standard is fastened to a floor A³ or other suitable support, so as to be stationary.

To the frame A' are attached a number of arms a^3 . To these arms blocks a^4 are fitted 25 in such manner as to be free to slide lengthwise of the arms and consequently toward and from the center of the frame A'. Screws a^5 , having a bearing at the outer ends of the arms a^3 and engaging with tapped holes in the sliding blocks a^4 , afford provision for 30 adjusting the blocks lengthwise of the arms. To the blocks a^4 blocks a^6 are fitted, so as to be capable of sliding vertically. Screws a^7 , having a bearing at the lower ends of the blocks a^4 , and engaging with the tapped holes in the blocks a^6 , afford provision for adjusting the 35 blocks a^6 vertically. The blocks a^4 may be fitted to the arms a^3 by means of dovetailed tenons and grooves and the blocks a^6 may in the same manner be fitted to the blocks a^4 . Not only do the screws a^5 a^7 afford provision for adjusting the blocks, but they also answer to hold the blocks in position. Arms a^8 are 40 pivotally connected by pins or screws a^9 to the upper ends of the blocks a^6 , and have formed in them concentrically with these pins arc-shaped slots a^{10} , through which clamping-screws a^{11} pass, and after extending through the same enter tapped holes in the blocks a^6 . 45 This manner of connecting the arms a^8 with the blocks a^6 affords provision for adjusting these arms a^8 at different inclinations to the horizontal.

The arms a^8 serve to sustain the plates forming the supports A. They therefore have cy- 55 lindric bosses a^{12} formed upon their upper sides, and the plates A have corresponding holes formed through them. The plates may be slipped over the bosses, and when this is done will be supported by circular flanges a^{13} , 60 which are located at the base of the bosses. The plates can be lifted off at any time. It is clear also that the plates may be rotated on the bosses either by applying the hand to 65 them or through some suitable mechanism.

The arms a^8 are provided at their outer ends with slideways a^{14} , consisting of two parallel

ribs projecting from one side. In these slideways fit the lower extremities of bent arms b , which are shown as vertically slotted at the 70 portions fitting within the slideways to receive clamping-screws b' , that pass through them and engage with tapped holes formed in the backs of the slideways. The upper ex- 75 tremities of these arms b extend toward the center line of the frame A'. At a point above the centers of the bosses a^{12} they are provided with sockets b^2 , which receive rods b^3 , having the holders B connected to their lower ends. Preferably the connection will be made by 80 circumferentially grooving the lower ends of the rods and inserting in the hubs of the holders B screws or pins which will enter the circumferential grooves. The rods b^3 are intended to be capable of a longitudinal 85 movement toward and from the supports A, and to the end that such movement may be easily imparted to them levers b^4 are combined with them. These levers are fulcrumed to lugs b^5 , with which the arms b are provided, 90 and at one end are pivotally connected by pins b^6 with the rods b^3 , a sufficiently loose connection being made to prevent the swinging of the lever from interfering with the described movement of the rods. The other 95 ends of the levers form handles through which the levers may be oscillated to move the rods longitudinally. Springs b^7 , fitted between the arms b and those arms of the levers b^4 which form the handles, serve to so actuate the le- 100 vers as to cause them to lower and retain the holders B upon articles arranged intermediate of the latter and the supports A.

Figs. 13 and 14 illustrate a modification of the means for operating the holders B. The 105 holders are faced with some elastic substance, such, for instance, as the composition b^{40} , ordinarily used for inking rollers of printing-machines, comprising glue and glycerine, having its lower surface protected by a sheet of 110 india-rubber b^{41} . The holders are attached, as in the principal example of the improvement, to rods b^3 , sliding in sockets b^2 . To the sockets b^2 are secured plates b^{42} , which have arc-shaped edges provided with ratchet-teeth. 115 Levers b^{43} are fulcrumed to pins b^{44} , which are connected with the plates b^{42} , concentrically with the curved edges of the latter. The levers b^{43} are provided with pivoted pawls b^{45} , which act in connection with the ratchet-teeth 120 of the plate b^{42} . Springs b^{46} hold the pawls in engagement with the ratchet-teeth. The rods b^3 are provided with teeth and the adjacent end of the levers b^{43} are provided with a series of teeth extending concentrically with the 125 pivot-pins b^{44} . The holders may be quickly lowered by swinging the levers upward and the pawls will hold the levers in position after such adjustment. By disengaging the pawls from the ratchet-teeth the levers may 130 be swung in the reverse direction to elevate the holders.

Now I will describe a mechanism which is combined with each of the plates A to impart

rotary motion to it for the purpose of presenting to the types C' different portions of the surface of articles arranged upon said supports. In giving this description I will ask

attention only to Figs. 7 and 8.

a^{15} designates an arm which at one end is provided with a hole of a size to fit snugly upon the flange a^{13} , so that the arm may oscillate upon the same. At the outer extremity is a handle, by which it may be oscillated. To this handle an arc-shaped strip of metal a^{16} is fastened by means of a screw or otherwise. At one end this strip of metal is provided with a hook a^{17} , which is adapted to engage with a pin a^{18} , fastened in the arm a^8 .

a^{19} is a stop-arm fastened to the arm a^8 . When the arm a^{15} is oscillated in one direction, its handle will abut against the stop-arm a^{19} , and in this way be prevented from further movement. When it is moved in the reverse direction, the hook a^{17} will engage with the pin a^{18} and terminate the movement of the arm. It will thus be seen that the arm a^{15} has but a limited movement. This arm is made resilient; hence it may be bent downward. From its upper surface projects a pin a^{20} . This pin is free to engage with any one of a number of holes a^{21} , arranged in a circular row in the plate A.

a^{22} is another circular row of holes. The pin a^{20} may be disengaged from the arm a^{15} and inserted in a different position to coact with a hole a^{22} when desired to locate printing differently upon the articles carried by a support A.

The support A is rotated in the direction indicated by the arrow in Fig. 7. Normally the pin a^{20} of the arm a^{15} will be in engagement with one of the holes of the plate. When it is desirable to impart movement to the plate, the arm a^{15} will be oscillated until arrested by the stop-arm a^{19} . Then said arm a^{15} will be depressed and oscillated reversely as far as permitted by the hook a^{17} , whereupon it will be released and on rising will cause its pin a^{20} to engage with the next hole of the series in the plate A, with which it is arranged to coact. The plate will offer such resistance to movement as will cause it to remain stationary while the arm a^{15} is being returned to its normal position.

I will now describe the means employed for revolving the supports A to present articles upon said supports successively to the different types C'. An arm a^{23} is loosely mounted upon the standard A² and is connected with this standard by means of circular bands a^{24} a^{25} , surrounding the standard. Its outer extremity extends into proximity with the inner side of the frame A' and is provided with a longitudinally-movable bolt a^{26} , which is impelled outwardly by a spring a^{27} , coiled around it and acting at one end against one of the bearings of the bolt and at the other end against a cross-pin inserted in the bolt. The outer extremity of the bolt is beveled. In the frame A' are a number of holes or re-

cesses a^{28} , with which the bolt a^{26} may successively engage. When the arm a^{23} is oscillated in the direction indicated by the arrow marked adjacent to it in Fig. 4, the beveled end of the bolt will cause it to be retracted from that one of the holes a^{28} with which it was previously engaged, and as soon as the arm carries the bolt opposite to the next hole a^{28} the bolt will be shot outwardly and engaged with this hole. If afterward the arm is oscillated in the reverse direction to that indicated by the said arrow, it will impart motion to the frame A' in the direction indicated by the arrow which is marked adjacent to the exterior of the frame in Fig. 4.

The arm a^{23} is oscillated by a link or rod a^{29} , pivotally connected at one end to said arm and at the other end to one arm of a lever a^{30} , which is fulcrumed between the ends by a pin a^{31} to a bracket a^{32} , which is fastened to the floor A³ or other support. The other arm of the lever a^{30} is pivotally connected to one end of a link a^{33} , which at the other end is pivotally connected to a crank-wrist a^{34} , extending from a disk a^{35} , which is affixed to a shaft A⁴. This shaft is shown as supported in a bracket a^{36} , fastened to the floor A³. It is intended to be in constant motion during the operation of the machine; but it will of course only impart an intermittent motion to the frame A', because it will only transmit motion thereto when the arm a^{23} is oscillating in one direction.

Preferably the frame A' will be locked positively in position except at such times as it is required to move. I will now describe a mechanism by which it may be so locked.

a^{37} designates an arm, which at one end is rigidly fastened to the support A², and at the other end extends into proximity with the inner side of the frame A'. Near its outer extremity it is provided with bearings, which receive a longitudinally-movable locking-pin a^{38} . A spring a^{39} surrounds this pin between one of the bearings of the pin and a cross-pin inserted through the pin. This spring tends to force the pin a^{38} outward into one of the holes a^{28} of the frame A'. The inner end of the pin a^{38} is pivotally connected by a pin a^{40} to a lever a^{41} , which at one end is fulcrumed by a pin a^{42} to a transversely-projecting portion of the arm a^{37} , and at the other end is pivotally connected by a pin a^{43} to one end of a link a^{44} . The other end of the link a^{44} is pivotally connected by a pin a^{45} to one end of a link a^{46} , which at the other end is pivotally connected by a pin a^{47} to the arm a^{23} . The links a^{44} a^{46} are of such length that on the completion of the backward oscillation of the arm a^{23} in the direction indicated by the arrow which is marked upon it in Fig. 4, they will oscillate the lever a^{41} in such direction as to effect the withdrawal of the pin a^{38} from that one of the holes a^{28} of the frame A' with which it was engaged. These links a^{44} a^{46} do not, however, exert any influence upon the pin a^{38} until about the termination of the for-

ward movement of the arm a^{23} , and hence they leave the spring a^{39} free to act upon said pin a^{38} .

I will now describe the type-supports, the carriers for the latter, and the appurtenances of these parts.

D' designates a circular frame supported by arms d' , extending from a tubular hub d' , which fits upon the boss a^2 of the support A². The hub is secured against rotation by any suitable means—as, for instance, set-screws d^2 passing through a tapped hole in the hub and impinging against the said boss a^2 . To avoid any misapprehension, I will add that this frame does not have any motion whatever.

To the upper side of the frame D' a number of radially-extending slideways d^3 are fastened. In each of the slideways one of the carriers D is fitted. Each carrier may have dovetailed sides, and its slideway d^3 may have dovetailed walls for the purpose of precluding the carriers from tilting. The outer end of each carrier D has a block d^4 formed upon or secured to it, and in the outer face of each of these blocks is a horizontally-extending slideway, to which is fitted a block d^5 . The block d^4 and the portion of the block d^5 , engaging therewith will preferably be made dovetailed. In the face of each block d^5 is a vertical groove receiving a block d^6 . Such groove and the block d^6 may be dovetailed to secure their engagement. A set-screw d^7 , passing through a slot in the block d^5 and engaging with a tapped hole in the block d^6 , provides for adjusting the latter upward and downward. A set-screw d^8 , passing through a slot in the block d^4 and engaging with a tapped hole in the block d^5 , affords provision for adjusting the latter laterally. The block d^6 has a cylindric boss C formed upon it. This boss constitutes what has been previously termed a "type-holder." The type C' is provided with a socket c' , having an opening on one side, lugs adjacent to the opening, and a screw for drawing the lugs together, for the purpose of clamping the socket upon the holder.

Each type-carrier D is reciprocated inward and outward radially to the frame D' by means of a rod d^{10} . The rod is connected with the carrier by means of a screw d^{11} , which may engage with one of a number of holes arranged in a row extending lengthwise of the carriers.

Obviously the types may be adjusted farther outward and inward by changing the connection of the rods d^{10} with the carriers D. They may also be adjusted laterally and vertically by means of the blocks d^4 , d^5 , d^6 and rotarily by varying the position of their sockets c' upon the holders C.

The rods d^{10} are pivotally connected to bell-crank levers d^{12} , which are fulcrumed to upright arms d^{13} , rigidly affixed to the frame D', and braced by a cross-piece d^{23} , consisting of a circular or ring-shaped body and arms extending radially therefrom to the arms

d^{13} . The bell-crank levers are connected by links d^{14} to a vertically-movable head d^{15} , which is shown as of circular form and arranged concentrically with the hub d' of the frame D'. On the under side of this head are pairs of lugs, to which the upper ends of the links d^{14} are pivotally connected by cross-pins. The lower ends of the links d^{14} are pivotally connected to trunnions extending from blocks d^{16} , which are free to slide toward and from the fulcra of the levers d^{12} in slots with which said levers are provided. The slotted portions of the levers are fitted with screws d^{17} , which are incapable of longitudinal movement, but which engage with tapped holes in the blocks so that by rotating the screws by means of a wrench the connection between the links d^{14} and the levers d^{12} may be shifted nearer to or farther from the fulcra of the levers. Thus the pressure with which the types operate in printing may be varied. The head d^{15} is moved up and down by elevating and depressing a rod d^{18} , passing up through the support A² and through the head d^{15} . This rod has affixed to it collars d^{19} , d^{20} . Preferably these will be adjustably connected to the rod—as, for instance, by set-screws. When the rod is raised, the collar d^{19} will abut against the hub of the head d^{15} , and the continued upward movement of the rod will serve to raise the head. When the head d^{15} is raised, the carriers D for the type-holders are moved outward to the articles to be printed. A number of levers d^{21} are pivotally connected at the upper ends to the hub of the head d^{15} , and at the lower end are provided with inwardly-extending hooks. Near the lower ends these levers have eyes d^{22} , which slide along rods d^{24} when the head d^{15} is raised and lowered. These rods d^{24} extend from the brace d^{23} through holes in the head d^{15} . The rods are farther apart at the lower extremity than at the upper ends. On the raising of the rod d^{18} sufficiently to bring its collar d^{20} above the hooks of the levers d^{21} the latter will swing inward, so that their hooked ends will project beneath said collar, and after this the rod d^{18} will raise the head d^{15} . On the descent of the rod d^{18} its collar d^{20} will pull down the head d^{15} until the eyes d^{22} of the levers d^{21} reach the lower portions of the rods d^{24} , whereupon said levers will be swung outward sufficiently to cause their hooked lower ends to become disengaged from the collar d^{20} . The rod d^{18} may therefore have a longer movement than that which is necessary for imparting to the head d^{15} the necessary movement. The rod d^{18} is at the lower end connected by a link d^{26} with the crank-wrist a^{34} . Hence the rod will be raised and lowered by said crank.

I will now describe the means whereby the inking of the types is effected. The inking-tables F are preferably of circular form and supported so as to rotate about their axes. Each has a hub f fitting in a socket formed in a piece f' , fastened to a bracket f^2 . A ratchet-wheel f^3 is formed on the back of the

table. With this engages a pawl f^4 , having a weighted outer end which will keep its toothed end in engagement with the ratchet-wheel and pivoted between the ends to a lever f^5 . This lever f^5 is held against a cam f^6 by a spring f^7 . In this way each inking-table receives its rotary movement. It will be seen that each of the inking-tables is supported at an incline. The inking-rollers E are journaled in a carriage e , which is pivotally connected at the sides to rods e' , which are free to slide longitudinally in bearings forming part of a swinging frame e^2 . This frame at one end is affixed to a shaft f^8 , which carries the cam f^6 . Springs e^3 , coiled around the rods e' between the outer bearings and cross-pins with which the said rods are provided, draw such rods inward or, in other words, toward the shaft f^8 . The carriage e runs along rails e^4 , which extend vertically upward from a circular frame D^2 , and at the upper extremities are inclined or rounded inward or, in other words, toward the center line of the frame D^2 , said rails being terminated in a plane with the inking-table with which they co-operate.

The types C' will while in their normal positions have their faces substantially in a plane with the edges of the rails e^4 . The inking-rollers will, when the shafts f^8 are oscillated, work across the inking-tables and the types and so apply ink to the latter.

The circular frame D^2 is formed integrally with the arms d of the frame D' , and hence is supported from the same hub d' .

The swinging frames e^2 are oscillated by means of links e^5 , which at the lower ends are pivotally connected to the outer ends of said swinging frames and at the upper ends are pivotally connected to a circular frame E' , which is affixed to the upper end of the rod d^{18} . Hence when this rod is raised and lowered the inking-rollers will be made to ink the types.

It will be seen that by providing for a lost motion between the rod d^{18} and the head d^{15} , I am enabled to produce all the necessary movements of the inking-rollers and all the necessary movement of the types from one and the same rod.

In Fig. 12 I have shown an inking-table F faced with a sheet of india-rubber f^{20} . In this example of my improvement the rollers E are intended to be made of metal, preferably of brass, and they are combined with a rubber-faced roller E^{10} , which rotates in contact with them to distribute the ink. This combination I have found advantageous, especially for operating in connection with a type having a rubber face.

The articles to be printed are placed upon the supports A and the holders B are lowered upon them. The supports and holders may be adjusted up or down, toward or from the types, and at any desired angle relatively to the types. After the supports and holders shall have been properly adjusted the shaft A^4 will

move the rod d^{18} up and down, thereby causing the inking-rollers to apply ink to the types and forcing the types after inking to the articles to be printed and subsequently retracting them.

The types may severally consist of a holder c^{10} , of sheet metal, cylindric in form, containing a mass c^{11} of composition such as is used for printers' inking-rollers, composed, for example, of glue and glycerine, and a sheet c^{12} of flexible material—such, for instance, as rubber cloth—cut to the desired form and attached to said mass.

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

1. In a printing-machine, the combination of a number of type-holders, a number of separate and independently-adjustable supports for articles to be printed, and a movable frame for sustaining said supports and moving them past the type-holders, substantially as specified.

2. In a printing-machine, the combination of a number of type-holders, a number of separate and independent supports for articles to be printed, and a revolving frame for sustaining said supports and moving them past the type-holders, substantially as specified.

3. In a printing-machine, the combination of a number of separate and independent supports for articles to be printed, a movable frame for sustaining said supports, and reciprocating type-holders movable toward and from the supports, substantially as specified.

4. In a printing-machine, the combination of a number of supports for articles to be printed, a revolving frame for sustaining said supports, and type-holders arranged radially to said revolving frame and movable toward and from the supports, substantially as specified.

5. In a printing-machine, the combination of a support for an article to be printed, constructed to be capable of rotating on its own axis, and a reciprocating type-holder movable toward and from the said support, substantially as specified.

6. In a printing-machine, the combination of a number of supports constructed to be capable of rotating on their own axes, and a number of reciprocating type-holders movable toward and from said supports, substantially as specified.

7. In a printing-machine, the combination of a reciprocating type-holder, a support for an article to be printed, arranged opposite said type-holder, and a holder for the article to be printed, connected so as to be adjustable relatively to said support, substantially as specified.

8. In a printing-machine, the combination of a type-holder, a support for an article to be printed, arranged opposite said type-holder and made adjustable relatively to said type-holder, and a holder for the article to be printed, connected so as to be adjustable rela-

tively to said support, substantially as specified.

9. In a printing-machine, the combination of a rotary frame A', a stationary frame D', arms a^3 , extending from the frame A', sliding blocks A⁴ A⁶, screws a^5 a^7 , arms a^8 , pivotally connected to the blocks a^6 , supports A, holders B, connected to arms b , having an adjustable connection with the arms a^8 , reciprocating carriers D, connected with the frame D', and type-holders connected with said carriers, substantially as specified.

10. In a printing-machine, the combination of a rotary plate A, an arm a^{15} , a pin a^{20} for engaging with holes in said plate, a rod a^{16} , connected with said arms, hooks a^{17} , engaging with a pin a^{18} , extending from the support of said plate, and a stop a^{19} , also extending from the support of said plate, substantially as specified.

11. In a printing-machine, the combination of a number of type-holders, a number of supports for articles to be printed, a rotary frame carrying the latter and provided with holes, an arm swinging about the axis of said frame, a bolt moving lengthwise of said arm, and means, substantially such as described, for swinging said arm, substantially as specified.

12. In a printing-machine, the combination of a number of type-holders, a number of supports for articles to be printed, a rotary frame carrying the latter and provided with holes, an arm swinging about the axis of said frame, a bolt having a beveled end, a spring impelling said bolt outwardly, and means, substantially as described, for swinging said arm, substantially as specified.

13. In a printing-machine, the combination of a number of type-holders, a number of supports for articles to be printed, a rotary frame carrying the latter and provided with holes, an arm swinging about the axis of said frame, a bolt movable lengthwise of said arm, a lever connected with said arm, and a crank carried by a rotary shaft and connected with said lever, substantially as specified.

14. In a printing-machine, the combination of a number of type-holders, a number of supports for articles to be printed, a rotary frame carrying the latter and provided with holes, an arm swinging about the axis of said frame, a bolt movable lengthwise of said arm, mechanism, substantially such as described, for swinging the arm, a stationary arm, a pin movable lengthwise of said arm to engage with the holes of said frame, and connections, substantially such as described, between this pin and the swinging arm, substantially as specified.

15. In a printing-machine, the combination of a number of type-holders, a number of supports for articles to be printed, a rotary frame carrying the latter and provided with holes, an arm swinging about the axis of said frame, a bolt movable lengthwise of said arm, mechanism, substantially such as described, for swinging the arm, a stationary arm, a pin

movable lengthwise of said arm to engage with the holes of said frame, a lever fulcrumed to the last-mentioned arm and connected with said pin, and links a^{44} a^{46} , connected with said lever and also connected with said swinging arm, substantially as specified.

16. In a printing-machine, the combination, with supports for articles to be printed, of type-holders, carriers reciprocating toward and from the said supports, and rods for imparting motion to said carriers and having an adjustable connection with the latter, substantially as specified.

17. In a printing-machine, the combination, with supports for articles to be printed, of type-holders, carriers reciprocating toward and from the said supports, and sliding blocks connected one with each of the carriers and another with each of the type-holders, whereby provision is afforded for adjusting the type-holders relatively to the carriers, substantially as specified.

18. In a printing-machine, the combination, with supports for articles to be printed, of type-holders, carriers reciprocating toward and from the said supports, and two sliding blocks intermediate of each of the carriers and type-holders and affording provision for an adjustment of the type-holders in two directions laterally and vertically independently of the carriers, substantially as specified.

19. In a printing-machine, the combination, with supports for articles to be printed, of type-holders, carriers reciprocating toward and from said supports, and type connected with the type-holders, so as to be capable of adjustment rotarily, and arranged with their axes of rotation parallel with the lines of reciprocation of the carriers, substantially as specified.

20. In a printing-machine, the combination of supports for articles to be printed, type-holders reciprocating toward and from said supports, carriers with which said type-holders are connected, rods d^{10} , connected to the carriers, bell-crank levers d^{12} , fulcrumed to fixed supports, and a head moving transversely to the line of the reciprocation of the type-holders and connected with said bell-crank levers, substantially as specified.

21. In a printing-machine, the combination of supports for articles to be printed, type-holders reciprocating toward and from said supports, carriers with which said type-holders are connected, rods d^{10} , connected to the carriers, bell-crank levers d^{12} , fulcrumed to fixed supports, a head moving transversely to the line of the reciprocation of the type-holders, links connected with said head and connected with blocks fitted to slotted portions of the bell-crank levers, and screws fitted to the latter and serving to adjust said blocks relatively to the fulera of the levers, substantially as specified.

22. In a printing-machine, the combination of supports for articles to be printed, type-holders reciprocating toward and from said

supports, carriers with which said type-holders are connected, rods d^{10} , connected to the carriers, bell-crank levers d^{12} , fulcrumed to fixed supports, a head moving transversely

5 to the line of the reciprocation of the type-holders and connected with said bell-crank levers, and a crank for imparting upward movement to said head, substantially as specified.

10 23. In a printing-machine, the combination of supports for articles to be printed, reciprocating type-holders, bell-crank levers for moving the latter, a head connected with said bell-crank levers, an upright rod passing

15 through said head and serving to impart movement to said head throughout a portion of its movements, inking-rollers, and swinging arms carrying the inking-rollers and connected with said upright head, substantially as specified.

20 24. In a printing-machine, the combination of supports for articles to be printed, type-holders reciprocating toward and from the same, bell-crank levers reciprocating said

25 type-holders, a vertically-movable head con-

nected with said bell-crank levers, an upright rod extending through said head, collars on said rod, hooked levers connected with said head, rods d^{24} for oscillating these hooked levers, inking-rollers, swinging arms carrying 30 the inking-rollers, and links connected with said upright rod for oscillating the arms which carry the inking-rollers, substantially as specified.

25. In a printing-machine, the combination 35 of a support for articles to be printed, a type-carrier reciprocating toward and from the center of said support, and a type moving with said carrier and having a yielding surface, so that it may be flat for inking and 40 conform to convexities of surface in printing, substantially as specified.

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

THOMAS HARPER.

Witnesses:

EDWIN H. BROWN,
ANTHONY GREF.