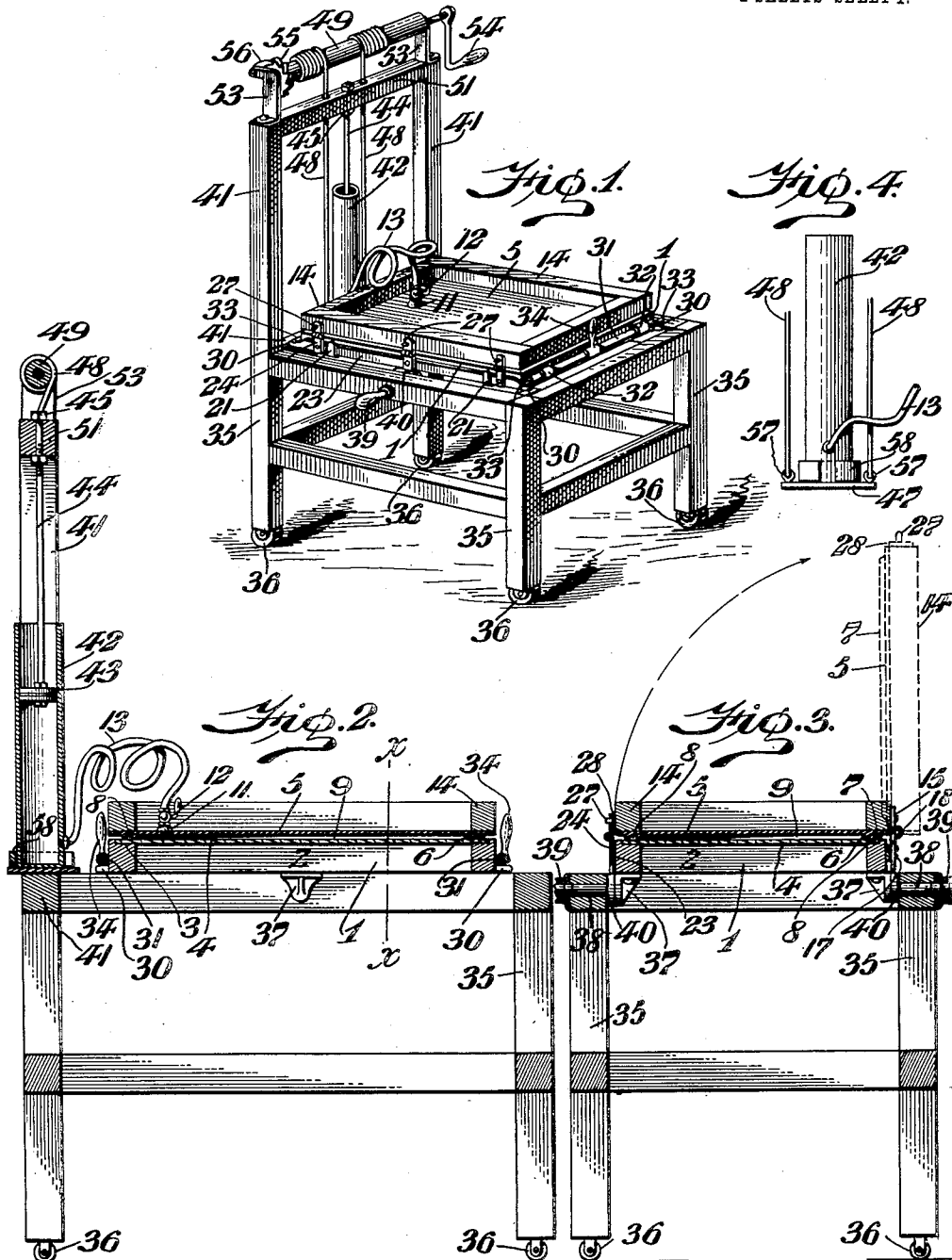


J. B. LEVY.
VACUUM CONTROLLED PRINTING FRAME.
APPLICATION FILED MAR. 20, 1913.

1,126,796.

Patented Feb. 2, 1915.

2 SHEETS-SHEET 1.



WITNESSES

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BY

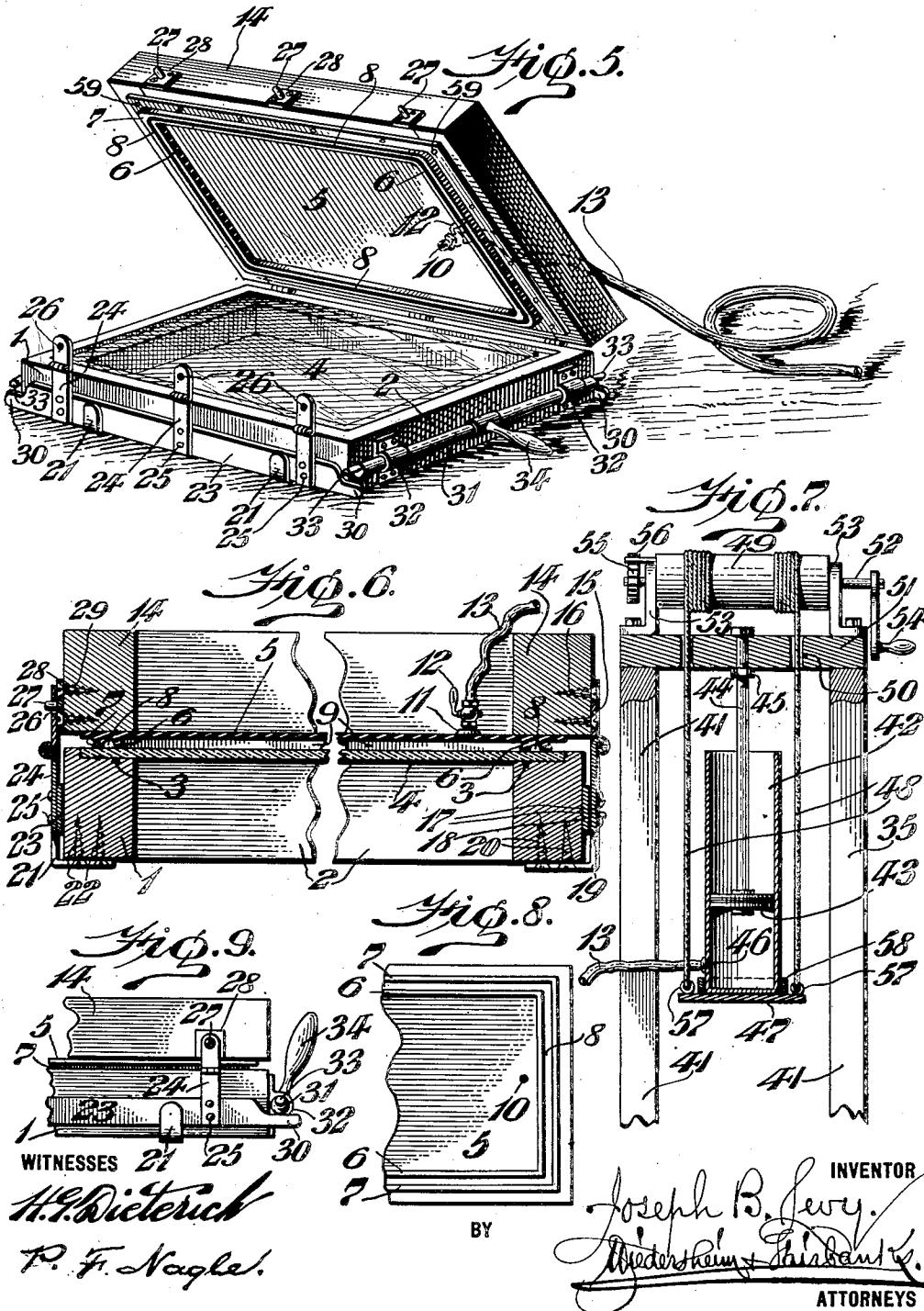
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UNITED STATES PATENT OFFICE.

JOSEPH B. LEVY, OF PHILADELPHIA, PENNSYLVANIA.

VACUUM-CONTROLLED PRINTING-FRAME.

1,126,796.

Specification of Letters Patent.

Patented Feb. 2, 1915.

Application filed March 20, 1913. Serial No. 755,576.

To all whom it may concern:

Be it known that I, JOSEPH B. LEVY, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Vacuum-Controlled Printing-Frame, of which the following is a specification.

This invention relates to printing frames and more particularly to a mechanism for automatically producing and maintaining a desired vacuum in that portion of the printing frame occupied by the sensitized material. It relates also particularly to a novel clamping mechanism for effectively securing the parts of the frame together in normal operative position, so that the chamber or space for receiving the printing and light transmitting elements is substantially hermetically sealed, and the leakage of air to these parts is either eliminated or reduced to a minimum. In devices of this character, heretofore devised, it has been necessary to utilize either manually or mechanically operated pumping elements for causing the vacuum in the required space or chamber, but in practice it has been found that such structures do not operate in a satisfactory manner and have inherent defects which make them unsuited for this type of work. For example, the leakage of air into the vacuum space during a printing operation is of such proportions as to necessitate constant manipulation of the manual pump to maintain the proper conditions, therefore dividing the attention of the operator between the operation of the pump and the carrying out of the printing process. Where mechanically operated pumping elements are utilized the cost of printing is materially increased, and where a number of frames are in use, the mechanism is cumbersome, complicated, takes up a large amount of room and above all no reliance can be placed upon obtaining a predetermined or definite vacuum in any of the frames.

It is the object of my invention, to overcome the foregoing defects, as well as other disadvantages existing in apparatus of this character now in existence, and I have, in the present invention, devised a mechanism wherein the leakage of air to the vacuum space is reduced to a minimum and the vacuum produced is predetermined and automatically maintained throughout the printing process.

It further consists of other novel features

of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities, as herein shown and described.

Figure 1 represents a perspective of a printing apparatus embodying my invention. Fig. 2 represents a vertical section of the same. Fig. 3 represents a section on line $x-x$ Fig. 2. Fig. 4 represents a detail in elevation of the vacuum producing mechanism. Fig. 5 represents a perspective of the printing frame and its adjuncts. Fig. 6 represents a transverse section of the printing frame. Fig. 7 represents a vertical section of a portion of the stand showing certain details of construction. Fig. 8 represents a plan of a portion of the mat, showing the arrangement of the sealing ribs. Fig. 9 represents a detail showing the preferred form of locking mechanism.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings: 1 designates one section of a printing frame embodying my invention, and comprises a substantially rectangular frame having an opening 2 therethrough for the purpose of admitting light to the parts of the frame, which are adapted to contain the sensitive paper or the like. The frame section 1, in the present instance, is suitably rabbeted, as shown at 3, to receive a transparent plate 4, upon which the printing adjuncts are adapted to be placed and supported, and through which the light passes to effect the printing process.

5 designates a mat preferably of rubber or like flexible material, provided in the present instance, with an inner rib 6 and an outer rib 7, suitably spaced apart to form with the plate 4 an annular channel 8, extending continuously around the surface of the mat 5, and in close proximity to the sides thereof. It will be noted that the ribs 6 and 7 are arranged in substantially parallel relation to the side edges of the mat 5, and extend as continuous elements around

the mat. The contour of the transverse section of these ribs is preferably such as to cause the said ribs, when under pressure, to tightly grip the plate 4 and prevent leakage of air to the space 9 formed between the mat and the said plate. The sensitive material and print or negative are of course located in this space. In connection with the mat 5, it will be noted that a transverse opening 10 is provided therein, in alignment with which is a rubber nipple 11, preferably vulcanized to the mat 5, to which the valve 12 is secured and forms a connection with the air exhaust tube 13.

14 designates the second section of the printing frame also provided with an opening, and adapted to be pivotally secured to the section 2 so that the frame may be readily opened or closed as desired.

Referring to Fig. 1, it will be noted that in the preferred form of my invention, the mat 5 is secured in any well known manner to the inner portion of the section 14 and therefore moves with the said section. This construction is highly advantageous since it is possible thereby to open the frame and gain access directly to the printing adjuncts on the plate 4, thus dispensing with the removal of the mat as a separate element.

In the present instance, the two sections of the frame are secured together by means of a plurality of hinges 15 secured by screws 16 or like fastening devices to one side of the section 14, while the opposite member of said hinge is riveted or otherwise fixedly secured at 17, to a side clamping bar 18, the latter being normally positioned in close proximity to the side of the section 2 and maintained in operative relation through the medium of angle guide brackets 19. These latter are fixed to the section 2 by means of screws 20, or like fastening devices passing through one arm of the said brackets, thus locating the opposite arm of each bracket a sufficient distance from the side of the section 2 to permit free movement of the side bar 18. The opposite side of the section 2 is provided with similar brackets 21, secured by fastening devices 22, and forming guide members to receive a second clamping bar 23, which is freely supported therein. To this bar 23, suitable hinge members 24 are riveted or otherwise fixed, as shown at 25, and in one member thereof have an opening 26 adapted to receive a pin 27 forming a part of a plate 28, suitably secured by screws 29 or the like to the section 14. It will be noted that the ends of both the bar 18 and the bar 23 are cut away to form tongues 30, which project beyond the adjacent side of the section 2 and form lugs with which certain clamping adjuncts are adapted to engage, to cause the required locking of the two sections of the frame.

The clamping mechanism, in the present instance, comprises a rock spindle 31, suitably mounted, as here shown, in bearings 32 at opposite sides of the section 2, and having at each end a pin 33 formed eccentric with respect to the axis of the spindle 31, to project above one of the tongues 30. Each of the spindles 31 is provided with an operating handle 34, fixed in any desired manner thereto so that the spindles may be partially rotated to bring the pins 33 into engagement with the tongues 30, and cause the two sections of the frame to be drawn together and clamped in operative position.

In the preferred embodiment of my invention, the vacuum producing mechanism and the printing frame structure above described, form a complete unitary structure preferably mounted on a suitable stand or carriage 35, which may be moved from one place to another, since it is provided with suitable casters 36, as will be readily understood. The printing frame is mounted on this stand 35 in such a manner that it may be readily turned from one side to the other for the purposes of printing, and, in the present instance, I have secured at two opposite sides of the frame, the brackets 37 each carrying a threaded pivot pin 38 extending through the stand frame to receive a threaded handle 39 serving as a tightening means to secure the parts in fixed position. It will be noted that a washer 40 is interposed between the brackets 37 and the sides of the stand 35 in order to provide a clearance which permits the printing frame to swing from one position to another. The stand 35 is also provided with an extended or upright portion 41, serving as a support for a vacuum producing mechanism, comprising the cylinder 42, piston 43, and piston-rod 44, the former, in the present instance, being the movable element of the vacuum producing mechanism, and being suspended for actuation by gravity on one stroke, while the piston-rod 43 is fixed to the stand portion 41 by threading the said rod at one end and employing the nuts 45, though, of course, it will be understood, any well known means may be utilized for the purpose. The exhaust tube 13 of the mat 5 is connected to the cylinder 42 adjacent the working end thereof, and has communication therewith through the medium of the port 46.

47 designates a base normally supporting the cylinder 42 and suspended by suitable cables 48 from a winding drum 49, and it will here be noted that the two cables 48 are independent and wound from the same side of the drum 49 so that the cylinder 42 may be accurately raised or lowered. In the present construction, the cables 48 pass through respective openings 50 in the top cross-bar 51 of the stand portion 41, though, 130

it will be understood that various equivalent arrangements may be made of these parts. The winding drum 49, as here shown, is mounted on a spindle 52 rotatably mounted in bearing brackets 53 suitably fixed to the top 51, while upon one end of the said spindle 52, there is a handle crank 54, and upon the opposite end, a ratchet wheel 55 controlled by the pawl 56 suitably pivoted to a fixed part. The cables 48 are preferably secured by eye-bolts 57 or like devices to the base 47 and there is also sufficient space provided between the said cables and the cylinder 42 to allow an annular, split weight member 58 to be seated upon the base 47 to increase the action of gravity on the movable cylinder as desired. It will, of course, be apparent that any desired number of these weights may be placed in position about the cylinder 42 to regulate the action of the parts as necessary.

It will be apparent from the foregoing that gravity is dependent upon to produce the desired vacuum by the movement of the pump cylinder and the constant nature of this natural force particularly adapts its use for the purpose of maintaining a substantially unvarying condition in the vacuum space of the printing frame.

In the operation of the device, the sensitive material together with the print, negative or the like, are, of course, placed within the chamber 9 between the mat 5 and the light transmitting plate 4, and the removal of air from this space 9 therefore results in the flexible mat 5 being pressed firmly against the printing adjuncts by atmospheric pressure, thus giving the essential uniform contact to produce an even and perfect print.

Assuming that the printing adjuncts have been placed in position upon the plate 4, and that the mat 5 has been superposed by bringing the section 14 into contact relation with the section 1, the hinge members 24 are moved to bring the pins 27 into respective engagement with the openings 26, so that any movement of the clamping bars 23, in a direction to increase their distance from the opening between the two frame sections will cause the frame section 14 to move nearer the section 2. This action is produced by turning the handles 34 upwardly to cause a partial rotation of the spindles 31, in consequence of which the eccentrically arranged pins 33 will engage the tongues 30 and simultaneously shift the two clamping bars 18 and 23. It will thus be seen that the same clamping action takes place at each side of the frame, thereby uniformly distributing the clamping pressure and insuring a tight joint at all sides of the frame. It will be noted under this action that the ribs 6 will be forced tightly against the plate 4, forming two air tight joints around the

frame and minimizing the danger of leakage.

It will be understood from the foregoing description that the printing frame forms one element of the combination embraced by the vacuum producing means and the movable standard and therefore, after the printing frame has been closed and locked with the printing elements therein, its position upon the stand 35 is reversed by swinging it upon the pivot pins 38, after which it is held in fixed position by tightening the handle members 39. At this time, the drum 49 has been rotated to bring the cylinder 42 to substantially the upper end of its stroke, where the parts are held by the engagement of the pawl 56 with the ratchet wheel 55. One or more of the weight members or rings 58 are now placed in position, as shown in Fig. 3, and the vacuum producing mechanism is ready to be brought into use. The valve 12 is now opened to establish a communication between the space 9 and the working end of the cylinder 42, and the pawl 56 is thereupon drawn out of locking engagement with the ratchet 55 in order to release the parts controlled thereby. The cylinder 42 being thus released drops by gravity for a certain part of its stroke, this initial movement being determined by the relative volume proportions of the space 9 and the working space of the cylinder 42, and it will be noted that the proportion of these spaces forms an important and desirable feature of my invention. The relation, which I have found in practice to give the desired result, is one in which the volume of the working space or suction end of the cylinder 42 is materially greater than the volume of the space 9, and with this in mind, it will be apparent that the desired vacuum in the space 9 will be produced before the cylinder 42 has completed its downward stroke, and there will therefore be a constant suction upon the space 9 due to the action of gravity tending to pull the cylinder 42 to the end of its stroke. It is evident therefore that should there be any leakage of air into the space 9, because of leaking joints or imperfect contact of the mat 5, it will immediately be drawn into the suction space of the cylinder 42, and the cylinder will thereupon move correspondingly a fractional part of its stroke. By this means, I obtain, during the entire printing process, substantially the same degree of vacuum within the space 9 and furthermore, it will automatically be maintained without requiring any attention or action on the part of the operator.

It will be apparent that by providing a freely movable stand I have provided a compact and complete mechanism by which the printing frame and its adjuncts are all assembled as a complete unitary device, and

it is unnecessary in using the frame to dismantle certain parts and place one part here, another part there, as is frequently done in such devices, whereby great inconvenience, delay, and loss of time are entailed. On the contrary, in the use of my device, it is only necessary after rotating the frame from its printing position, to release the frame lock and raise one section, thereby also removing the mat 5 from contact relation with the plate 4, and giving access to the printing material. The movement of the mat 5 with the upper section 14 is made possible in view of the fact that it is preferably secured thereto by suitable tacks 59 or like fastening devices.

It will now be apparent that I have devised a complete unitary structure well adapted for the purpose intended, simple in construction and in operation, consisting of few parts and capable of maintaining substantially a constant vacuum in an automatic manner, and wherein there is no change in the conditions existing within the vacuum space, due to exterior variations in the vacuum producing apparatus.

It will now be apparent that I have devised a novel and useful construction of a vacuum controlled printing frame which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description, and while I have, in the present instance, shown and described a preferred embodiment thereof of which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

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

1. In a device of the character stated, a printing frame, a transparent plate carried thereby, a mat of flexible material in contact relation with said plate, gravity actuated suction means having a capacity greater than the volume of the space between said mat and said plate for producing and maintaining a substantially constant vacuum in said space.

2. In a device of the character stated, a printing frame, a transparent plate carried thereby, a mat of flexible material in contact relation with said plate in combination with a pumping element comprising a fixed piston, a cylinder suspended in operative relation with said piston and controlled by gravity on its suction stroke, and means to conduct air from one side of said mat to the working end of said cylinder whereby a constant vacuum is produced and maintained by said cylinder under the action of gravity.

3. In a device of the character stated, the combination of a sectional printing frame, a transparent plate carried thereby, a mat of flexible material in contact relation with said plate, means to clamp said mat and plate between the sections of said frame, and gravity actuated suction means having a capacity greater than the volume of the space between said mat and said plate for producing and maintaining a substantially constant vacuum in said space.

4. In a device of the character stated, the combination of a sectional printing frame, a transparent plate carried thereby, a mat of flexible material in contact relation with said plate, means to clamp said mat and plate between the sections of said frame, a pumping element comprising a fixed piston, a suspended cylinder coöperating with said piston and controlled on its suction stroke by gravity, means to conduct air from one side of said mat to the working end of said cylinder, and means to vary the weight of said cylinder.

5. In a device of the character stated, a printing frame, a transparent plate carried thereby, a mat of flexible material forming with said plate a space of predetermined volume, means to clamp said mat and plate to said frame, a pumping element comprising a fixed piston, a suspended cylinder coöperating with said piston and controlled on its suction stroke by gravity, said cylinder having a working portion of greater volume than said space, and means to conduct air from said space to said working portion of said cylinder, whereby, in operative position of said cylinder, a constant vacuum is produced and maintained by gravity in said space.

6. In a device of the character stated, a printing frame, a transparent plate carried thereby, a mat of flexible material forming with said plate a space of predetermined volume, means to clamp said mat and plate to said frame, a pumping element comprising a fixed piston, a suspended cylinder coöperating with said piston and controlled on its suction stroke by gravity, said cylinder having a working portion of greater volume than said space, means to conduct air from said space to said working portion of said cylinder, and means to vary the weight of said cylinder, whereby, in operative position of said cylinder, a constant vacuum of predetermined degree is produced and maintained by gravity in said space.

7. In a device of the character stated, a sectional printing frame, a plate of transparent material supported by one section, a flexible mat positioned adjacent said plate, a clamping bar hinged to one of said sections and normally located adjacent the second section, a second clamping bar freely supported at the opposite side of said

second section, means to detachably secure said second bar to said first section, and means to move each clamping bar to clamp said sections together.

5 8. In a device of the character stated, a sectional printing frame, a plate of transparent material supported by one section, a flexible mat in contact relation with said plate, a clamping bar hinged to one of said
10 sections and normally located adjacent the second section, a second clamping bar freely supported at the opposite side of said second section, a tongue formed on each end of each clamping bar and projecting beyond
15 the respective side of said frame section, and means to engage said tongues to move each clamping bar to clamp said sections together.

9. In a device of the character stated, a sectional printing frame, a plate of transparent material supported by one section, a flexible mat positioned adjacent said plate, a clamping bar hinged to one of said sections and normally located adjacent the second section, a second clamping bar freely supported at the opposite side of said second section, means to detachably secure said second bar to said first section, and means to simultaneously shift each clamping bar
30 to clamp said sections together.

10. In a device of the character stated, the combination of a stand, a printing frame mounted thereon to swing from one position to another, a transparent plate carried by said frame, a mat of flexible material in contact relation with said plate, a cylinder, means carried by said stand for supporting said cylinder, a piston in said cylinder having fixed connection with said stand, means to conduct air from one side of said mat to the working end of said cylinder, and means for releasing said cylinder supporting means to cause said cylinder to be actuated by gravity on its suction stroke.
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45 11. In a device of the character stated, the combination of a freely movable stand, a printing frame pivoted thereto, a transparent plate carried by said frame, a mat of flexible material in contact relation with said plate, a vacuum producing mechanism mounted on said stand comprising a fixed piston, a cylinder suspended in operative relation with said piston and controlled by gravity on its suction stroke, and means to
50 conduct air from one side of said mat to the working end of said cylinder, whereby a constant vacuum is produced and main-

tained by said cylinder under the action of gravity.

12. In a device of the character stated, 60 the combination of a freely movable stand, a printing frame pivoted thereto, a transparent plate carried by said frame, a mat of flexible material in contact relation with said plate, a vacuum producing mechanism 65 mounted on said stand comprising a fixed piston, a cylinder suspended in operative relation to said piston and controlled by gravity on its suction stroke, a flexible tube forming a communication between one side 70 of said mat and the working end of said cylinder, and means to vary the weight of said cylinder, whereby varying degrees of vacuum are produced and maintained by said cylinder under the action of gravity. 75

13. In a device of the character stated, a printing frame, a transparent plate carried thereby, a suitable mat positioned in contact relation with said plate, and gravity actuated suction means having a capacity 80 greater than the volume of the space between said mat and said plate for producing and maintaining a substantially constant vacuum between said mat and said plate. 85

14. In a device of the character stated, a printing frame, a transparent plate carried thereby, a suitable mat positioned in contact relation with said plate, gravity actuated suction means having a capacity 90 greater than the volume of the space between said mat and said plate for producing and maintaining a substantially constant vacuum between said mat and said plate, and means for varying the action of said suction means to obtain a predetermined degree of vacuum in said space. 95

15. In a device of the character stated, a sectional printing frame, a plate of transparent material supported by one section, 100 a flexible mat positioned adjacent said plate, clamping members hinged to one of said frame sections and each having a portion extending adjacent the second section, and a plurality of bars arranged transversely of said frame each having eccentric ends adapted to coact with said clamping members whereby said sections are clamped together at will. 105

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Witnesses:

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