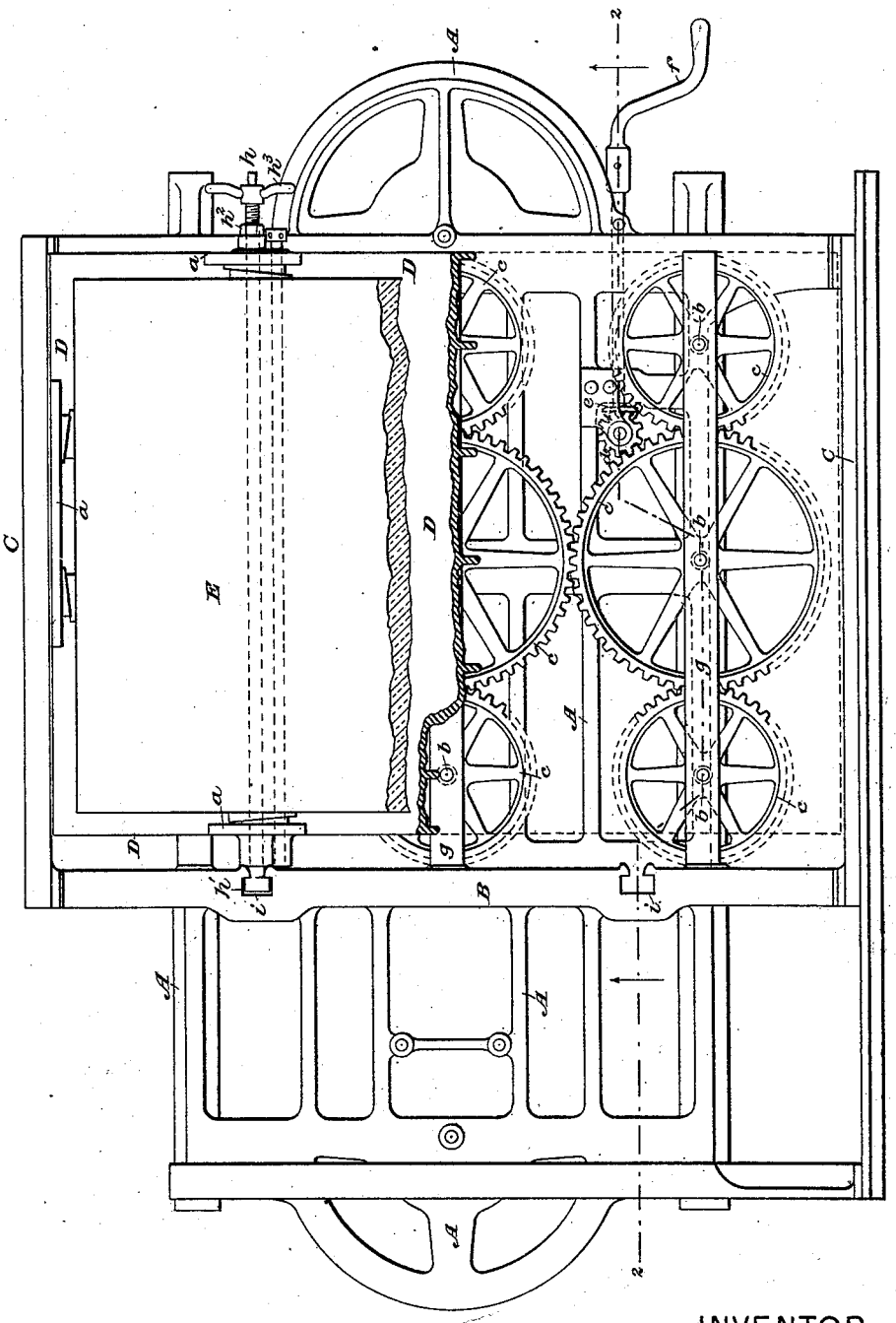
(No Model.) 4 Sheets—Sheet 1.

A. CAMPBELL.

PRINTING MACHINE.

No. 345,669. Patented July 20, 1886.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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PRINTING MACHINE.

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Fig. 2.

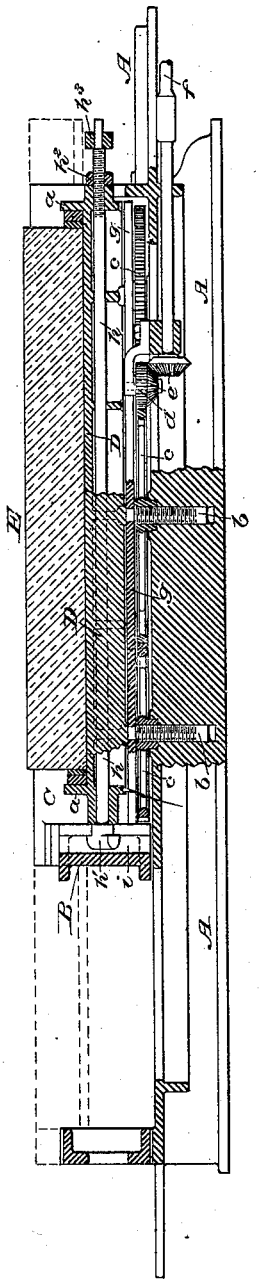

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Fig. 5.

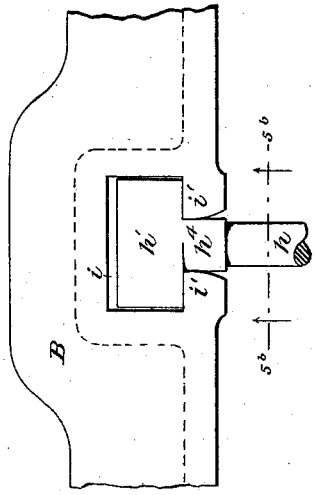


Fig. 5ª.

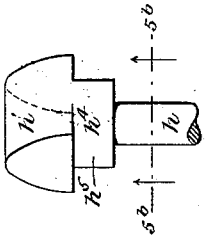


Fig. 5ᵇ.

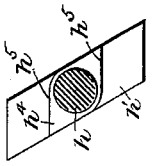


Fig. 4.

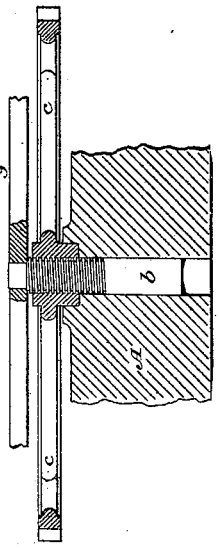
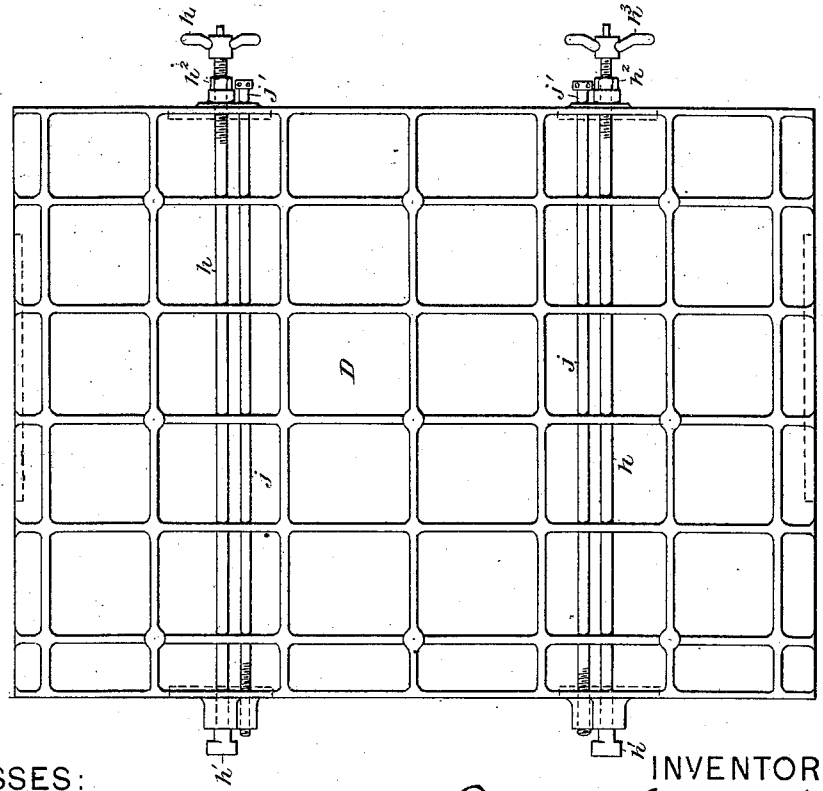


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4.

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PRINTING MACHINE.

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Fig. 6.

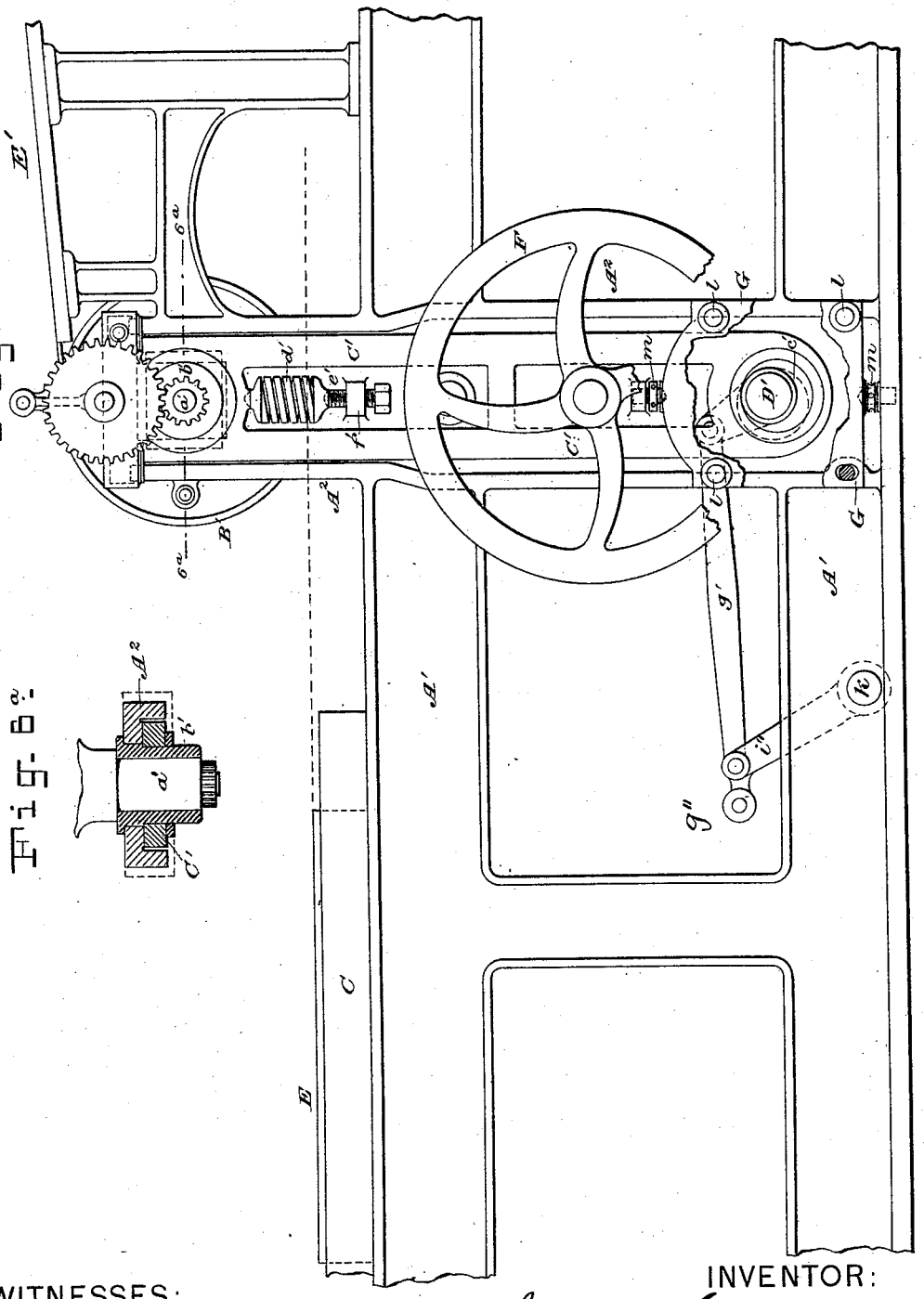

Fig. 6a.

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UNITED STATES PATENT OFFICE.

ANDREW CAMPBELL, OF BROOKLYN, ASSIGNOR TO JOHN McLOUGHLIN AND EDMUND McLOUGHLIN, OF NEW YORK, N. Y.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 345,669, dated July 20, 1886.

Application filed December 2, 1884. Serial No. 149,315. (No model.)

To all whom it may concern:

Be it known that I, ANDREW CAMPBELL, a citizen of the United States, and a resident of Brooklyn, Kings county, New York, have invented certain Improvements in Printing-Machines, of which the following is a specification.

My invention relates to that class of printing-presses known as "cylinder-presses," and which employ an impression-cylinder and a reciprocating bed.

The novel features of the invention will be fully set forth hereinafter, and defined in the claims; but I may say, briefly, that they consist, partly, in the mounting of the impression-cylinder of a lithographic press which has a continuous rotary motion in non-yielding bearings, and providing it with suitable mechanism for imparting the vertical movement which lifts the cylinder off the bed at the backward movement of the latter; partly in the peculiar construction of the bed, whereby the auxiliary or stone bed may be readily and conveniently slipped on and off the press-bed without disturbing the register or impression, thus enabling the workman to set the various stones bearing the different colors on their respective stone-beds while the latter are off the press, and to change or shift the said beds on and off the press-bed and secure them in place without disturbing the register and impression, and partly in the mechanism for securing the stone-bed on the press-bed, which mechanism will be hereinafter fully described.

Heretofore in lithographic cylinder-presses it has been proposed to fix or set the stone on a bed with raised side flanges, and to set this bed on four impression-screws arranged at the corners of the tray-like bed of the press. The lateral adjustment of the stone-bed in this construction is effected by screws which pass horizontally through the sides of the press-bed and bear on the four sides of the stone-bed. This construction differs from mine, in that the stone-bed cannot be removed without disturbing the register, and the stone-bed cannot be slipped out at the back of the press. Indeed, the construction does not contemplate the ready removal of the stone-bed from the press. It also differs from my construction in that the impression-cylinder, although mounted in unyielding bearings, has an intermittently-rotary motion, and no vertical movement.

Another proposed construction employs a vertically-adjustable bed with beveled lugs on its lower face, which extend down through apertures in the press-bed. The stone is fixed on a plate secured to this bed by screws. This construction differs from mine, in that the stone-bed is not readily removable, and the register must inevitably be destroyed whenever the stone is taken from the press.

These proposed constructions are not all that have been suggested or employed; but they approach nearest to mine of any that I know of.

Having thus briefly described those known constructions in lithographic presses that approach most nearly to mine in construction, I will now set forth the objects of my invention and what I seek to attain by my improvements. These are—

First. To provide the press with a removable bed, which, for a lithographic press, I call a "stone-bed," that may be readily slipped off and on the reciprocating press-bed, and which, when slipped on and secured in place, will always occupy the same position that it did before removal. Thus the most unskillful workman may remove the bed and replace it without affecting in the slightest degree either the register or the impression. This is of great importance in lithographic work, where several stones each bearing a different color of the design are used, and these must register perfectly with each other. In such cases one of my removable stone-beds may be provided for each stone, and the stone be set and keyed fast thereon before the bed is slipped onto the press.

Second. Facility of obtaining a perfect register and maintaining the same, even though the stone be removed from and replaced on the press any number of times. This I effect by my construction of the stone-bed, and by its attachment to the press-bed only at its front edge, as will be described hereinafter.

Third. Facility and certainty of obtaining

a perfect impression, which will not be disturbed by the removal of the stone-bed and its replacement. This bed rests upon bars which are mounted on adjusting-screws distributed over the surface of the press-bed, and means are provided for adjusting these screws up or down simultaneously and to the same extent.

I am aware that it is not new, broadly speaking, to mount a vertically-adjustable bed on a printing-press, and to raise this bed by screws uniformly distributed over its bottom surface and operated simultaneously or synchronously, and I do not claim this feature in itself.

Fourth. Certainty of impression, due to making the stone of a perfectly-uniform thickness, with perfectly-level faces, and employing a non-yielding impression-cylinder. The stone sets fairly on the stone-bed, and no underlaying or "shingling" is employed. Consequently I do not require a yielding impression-cylinder, which is essential where the stones are not perfectly true.

In the drawings which serve to illustrate my invention, Figure 1 is a plan of the reciprocating bed of a printing-press provided with my improvements, showing one-half of the removable or stone bed, and the stone keyed thereon at the upper side of the figure. Fig. 2 is a vertical longitudinal section through the beds of the press and the stone, on line 2 2 in Fig. 1. Fig. 3 is a plan of the under side of the removable or stone bed. Fig. 4 is an enlarged sectional view illustrating the construction and arrangement of the nut-wheels and their screws, which form the impression-regulating mechanism. Figs. 5, 5^a, and 5^b are enlarged detached views designed to illustrate the locking device for securing the stone-bed in position on the press-bed. Fig. 5 is a plan; Fig. 5^a, a side elevation; and Fig. 5^b is a section on line 5^b 5^b in Fig. 5^a. Fig. 6 is a side elevation of a printing-press provided with my improvements, the view being designed especially to illustrate the mechanism for drawing down the impression-cylinder. All of the inking apparatus and much of the other mechanism of the press that has no bearing on my invention have been omitted from this figure. Fig. 6^a is a horizontal section on line 6^a 6^a in Fig. 6.

A A represent the reciprocating bed of a printing-press, which may be mounted and arranged to slide or play in the usual way. This bed is provided with a cross-beam, B, and rails C C at the sides; but the back (at the right in Fig. 1) is left open, so that the removable or stone-bed may be slipped on and off. D is this stone bed, it being usually a cast-iron plate strongly ribbed on its under side, (see Fig. 3,) to give it stiffness and strength, and provided on its upper side with raised marginal flanges *a a*, for the wedges or quoins to take against in keying fast the stone E when it has been properly placed on bed D. The stone-bed D does not rest directly upon the reciprocating press-bed A, but upon a platform of bars, which may be adjusted up and down with the greatest accuracy by screws. This is the mechanism for adjusting and regulating the impression, and it comprises a series of screws, *b b*, (I usually employ nine,) dropped into sockets in the bed A of the press and provided with toothed wheel-nuts *c c*, which intermesh in such manner that when one is driven all will rotate in unison. These toothed wheel-nuts are rotated through the medium of a pinion, *d*, miter-gears *e*, and a crank, *f*, fixed on the shaft of one of the gears *e*. As the wheel-nuts *c c* are not all of the same diameter, three being larger than the other six, and as some rotate in one direction and some in the other, it is obvious that allowance must be made for these peculiarities in determining the pitch and direction of the threads of the several screws *b*, in order that when the wheels *c* are turned the screws may all rise or fall to the same extent.

Extending lengthwise of the press-bed and mounted each on three screws, *b*, in line, are bars *g*, (I usually employ three,) which form the platform on which the stone-bed D rests, and on which it slides in and out from the press-bed. A portion of the top end of each screw *b* is slightly reduced in diameter, and these reduced tips fit snugly into holes bored in the bars *g*.

When the stone-bed is slipped onto the press-bed, it must be secured in position thereon, and it is desirable, also, that the said bed have a limited adjustment longitudinally, to correct the register, and that when once properly adjusted as to register and impression it may be removed and replaced by any ordinary workman without disturbing these adjustments. I will now describe my means for effecting these objects. Under the stone-bed D, longitudinally of the press-bed, extend one or more (preferably two) rods, *h*, which are rotatively mounted in bearings in the marginal flanges of the bed. Each of these rods has at one end a T-head or locking-head, *h'*, and is screw-threaded on its other end and provided with an adjusting-nut, h^2, and an operating-handle, h^3. The locking-heads *h'* are arranged to engage T-shaped locking recesses or sockets *i* in the cross-beam B, when the bed D is pushed home.

Referring to Figs. 5, 5^a, and 5^b most particularly, I will more minutely describe this locking device. The head *h'* is preferably brought to a blunt edge on its front, in order that when turned to stand vertical it may enter between the flared jambs of the socket *i*. When once inserted, the head is turned until its ends engage the inner faces of the jambs *i' i'*, Fig. 5, and it cannot be withdrawn without first being turned back. The inner faces of the jambs and the sides of the passage between them are dressed true and smooth, and the lateral position of the bed D is gaged by a boss, h^4, which connects rod *h* with the head *h'*. This boss has the form clearly shown in Fig. 5^b, and when the head *h'* has entered recess *i*, and been turned until the faces h^5 on the boss rest against the

sides of the passage between jambs i', the rod h can be turned no farther, and the boss will fit snugly between the jambs. There being two rods h provided in this manner, and the bosses h^4 being made to fit accurately between the jambs i', it will be seen that this will always insure the placing of bed D properly on the press-bed so far as its lateral position is concerned. Indeed, it cannot be set wrong, if the press is properly made.

The bed D might be provided with lateral guides in addition to the means above described, or in lieu of them; but I prefer the arrangement shown. As described, the means provided secure the removable bed to the press-bed, and also insure its lateral adjustment.

When the locking has been effected, the bed may be adjusted to and fro on the press-bed by the following means: Extending under the stone-bed and having bearings in the pendent marginal flanges of said bed are one or more adjusting rods or screws, j. These screws are threaded in bosses on the flange of the bed, and each is or may be provided with a capstan-head, j', whereby the screw may be turned. I usually employ two of these screws j, and mount them alongside of the locking-rods h.

The adjustment of the bed D is effected as follows: If the bed is to be moved out, the nut h^2 on rod h is slackened and run back. The screw j is screwed in, and its end, pressing upon the vertical face of the cross-beam B, pushes the bed out as far as desired. The nut h^2 is now run down and tightened up against the flange on the bed. This clamps the bed fast in position on the press-bed. If the bed is to be moved in, then the screw-rod j is turned back and the nut h^2 run down to push the bed in until the end of screw-rod j impinges on beam B. As the locking-heads h are free to move up and down in the sockets i, the bed D may be readily adjusted up or down, to regulate the impression. This may be done by applying power to the crank f, which operates the nut-wheels c. The stone-bed D enters freely between the side rails or bars, C C, of the press-bed, and no readjustment of the stone-bed laterally is required, as any fault in the register that will require a slight lateral adjustment may be readily corrected by an adjustment of the side guide on the feed-board. It will be obvious, however, that by employing my removable bed and its adjusting mechanism the said bed may be taken off and replaced as often as desired without disturbing the register or impression, and where several colors are being printed the stones of one or more of the colors may be set and keyed up in their respective beds while the stone of another color is being printed from.

I have omitted from Figs. 1 and 2 the inking-table, which would be arranged at the left in these figures. I make the upper surface of the stone-bed D perfectly true and level and mount it upon numerous screws b, so distributed over the surface as to prevent any sagging when the impression is made. The ribbed construction of the bed seen in Fig. 3 also serves to prevent any yielding or springing under the impression. My object is to provide a perfectly true and unyielding bed for the stone E. This stone I grind to a uniform thickness throughout, and as near as may be to a perfect level, so that when keyed up on the bed D its lower face will be in contact with the face of the bed at all points. Having thus provided a non-yielding but truly-level printing-surface, I am enabled to employ also an impression-cylinder that is unyielding when the impression is made. Thus I am enabled to exert in making the impression an enormous pressure, which could not be obtained otherwise without breaking the stones. Another advantage, also, is that the amount of pressure used in making the impression can be gaged to a nicety, whereas when springs are employed to take the pressure a nice degree of accuracy cannot be attained, as is well known. The great advantage of a perfectly level and uniform printing-surface and a heavy impression in lithographic work is this: I am enabled to use much less ink, as the heavy impression picks it all up. By the ordinary method of printing on lithographic presses of this character the quantity of ink employed is relatively much greater than I employ, and the inked lines are continually spread or widened as the printing proceeds by the spreading of the ink. It is found also that the surplus ink at the edges of the lines gradually grinds or cuts away the stone, and thus injures the design.

In Figs. 6 and 6^a I have shown my method of mounting and operating the impression-cylinder. A′ is the main frame of a printing-press, on which slides the reciprocating bed A. (Shown in Fig. 1.) A^2 shows one of two upright parts of said frame, in which are mounted the axes a' of the impression-cylinder B′. The axes rotate in boxes b', the squared portions of which have a little vertical play in the uprights A^2. The outwardly-projecting cylindrical portions of the boxes b' pass through side rods, C′, which rest against the outer faces of the uprights A^2.

As the mechanism at both sides of the press-frame are the same, and the impression-cylinder is mounted alike at both ends, I will simply describe the mechanism at one side, as shown in Fig. 6. The side rod, C′, may swing a little, pendulum-like, on the axis of the impression-cylinder, and through its lower end passes a shaft, D′, on which is an eccentric, c', which fits in a bearing or yoke in the end of side rod, C′. By rocking the shaft D′ back and forth the side rod, C′, is caused to move up and down endwise, and to move the impression-cylinder up and down also. As there are two side rods, C′, one at each end of the cylinder, and two eccentrics, c', on shaft D′, it will be seen that

both ends of the cylinder will be actuated simultaneously, and the latter will be drawn down evenly.

In order to take the weight of the impression-cylinder and other parts off the eccentrics on shaft D', I arrange a spring, *d'*, within an opening in side rod, C', and between said rod and a supporting and adjusting screw, *e'*, which screws through a lug, *f''*, on the press-frame. These springs, one on each side, may be constructed and adjusted so as to counterbalance or more than counterbalance the weight of the impression-cylinder, the side rods, C', the shaft D', and all attached parts. The eccentric might be a cam arranged to draw down the cylinder, while the springs *d'* are relied upon to raise it. The shaft D' is oscillated or rocked by means of a crank, (see dotted lines in Fig. 6,) which is coupled by a link, *g'*, to an arm or crank, *i''*, on a stud, *k*. This arm *i''* has a roller, *g''*, arranged to engage a grooved cam, (not shown,) to which motion is imparted through the ordinary press-operating mechanism, which I have not deemed it necessary to show, as I make no claims herein to the specific means I have described for lowering and raising the impression-cylinder.

The necessity of raising and lowering the impression-cylinder arises from the continuous rotation of the latter in one direction. The reciprocating bed moves back while the cylinder is raised.

E' is the feed board or table, and F the fly-wheel.

The eccentric or cam *e'* need have only a very limited "throw," as it is only necessary to raise the impression-cylinder high enough to fairly clear the stone on the out stroke or movement of the press-bed. The eccentric-shaft D' has bearings in provisions G, (partly broken away in Fig. 6,) which are bolted to the upright A^2 by bolts *l*, in such a way as to permit said provisions to be adjusted or set up or down to a limited extent, and this adjustment is effected by screws *m m*. When adjusted to the proper level, the bolts *l* are tightened up. Ordinarily this adjustment is effected, once for all, when the press is set up, and the further adjustment for impression is effected by the screws under the stone-bed D.

I do not limit myself to the particular constructions of the details of the mechanism as herein shown, as these may be varied somewhat without departing from my invention. For example, the extension of screw *j* and rod *h* across the removable bed is only for convenience in getting at them for securing and adjusting the bed. They might be short and unprovided with operating handles or heads, in which case they could be turned with a pincher or wrench. Any mode of mounting the impression-cylinder in unyielding bearings would comply in this respect with the requirements of my invention, and for the bars *g* a plate extending over all the screws *b* might be substituted.

Having thus described my invention, I claim—

1. The combination, in a printing-press, of the reciprocating bed provided with a raised front cross beam or rail, but unprovided with a rail at the back, for the reasons set forth, and the removable bed D, provided with securing devices at its front edge only for securing it to the cross-beam of the reciprocating bed, and with register-adjusting devices at its front edge only, whereby said removable bed may be readily disengaged and slipped off from the reciprocating bed without disturbing the register, substantially as set forth.

2. The combination, in a printing-press, of the reciprocating bed provided with a raised front cross beam or rail, but unprovided with a rail at the back, for the reasons set forth, and said raised cross-beam provided with locking-sockets, and the removable bed D, provided with locking devices, each comprising a locking-head to engage the locking-socket in the reciprocating bed, and an adjusting-nut to set said heads toward or from the bed D, and said bed D also provided with screws arranged at or near the locking-points to set or bear against the cross-beam of the reciprocating bed and adjust the register, substantially as and for the purposes set forth.

3. The combination, in a printing-press, of the reciprocating bed having a raised cross beam or rail, B, at the front, but unprovided with a rail at the back, as set forth, and the removable bed D, provided with and carrying the means for securing said bed D to the reciprocating bed, and also carrying the screws for adjusting the register, substantially as described.

4. The combination, in a printing-press, of the reciprocating bed A, provided with a raised cross beam or rail, B, provided with locking-sockets, the mechanism, substantially as described, for regulating the impression, the platform formed of the bars *g*, mounted on the tops of the impression-regulating screws, the removable bed D, mounted on said bars *g*, and secured only at its front edge to the bed A, and means, substantially as described, borne by the bed D for securing said bed to the bed A, whereby the bed D may be adjusted vertically for impression and be capable of removal and replacement without disturbing the register, substantially as set forth.

5. In a cylinder printing-press, the combination of the impression-cylinder mounted to rotate continuously on non-yielding axes, the mechanism, substantially as described, for imparting a vertical movement to said cylinder, in order to permit of the backward movement of the bed, the reciprocating bed A, the removable bed D, secured at its front edge only to the bed A, and means, substantially as described, for adjusting said bed D horizontally and vertically with respect to the bed A, substantially as set forth.

6. In a cylinder printing-press wherein the

impression-cylinder is mounted to rotate continuously in non-yielding axes and has a vertical movement, as described, the combination, with said cylinder, of the reciprocating bed provided with synchronously-operated impression-screws to regulate the impression, the removable bed D, mounted on said screws in the reciprocating bed and secured to the latter only at its front edge, for the purposes specified, the means, substantially as described, borne by bed D, for adjusting it horizontally on the reciprocating bed, and the stone E, made true on both faces and secured to said bed D, substantially as and for the purposes set forth.

7. A removable stone-bed, D, for a lithographic cylinder-press, provided with a level bottom, in order that it may slide freely over the press-bed, with raised marginal flanges *a a*, for the wedges or quoins to abut against in securing the stone thereon, with a level upper surface to receive the stone, and with securing devices, substantially as described, on its front edge only, to secure it to the press-bed, substantially as set forth.

8. As a means for gaging the lateral position of the removable bed on the reciprocating press-bed and for securing the former to the latter, the raised cross-beam B on the press-bed, provided with a recess, *i*, having jambs *i' i'*, with true faces, and the removable bed provided at its front edge with a rotatively-mounted T-head, *h'*, provided with a boss, h^4, constructed to engage and fit between the jambs of the socket *i*, substantially as set forth.

9. The combination, in a printing-press, of the reciprocating bed, the impression-screws *b*, mounted rotatively in sockets in said bed, the bars *g*, mounted on tenons on the tops of said screws, as described, whereby the screws may rotate in said bars, the intermeshing wheel-nuts *c*, whereby a longitudinal motion is imparted to said screws simultaneously in one direction, the operating-gears *d e*, the removable bed D, mounted on the bars *g*, and means, substantially as described, for locking the bed D at its front edge to the reciprocating bed, whereby said bed D is capable of being adjusted vertically for impression while locked, substantially as set forth.

10. The combination, in a printing-press, of the reciprocating press-bed provided with a locking-recess, *i*, and the removable bed D, provided with a rod, *h*, bearing a locking-head, *h'*, to engage recess *i*, and an adjusting and tightening nut, h^2, and said bed D also provided with an adjusting-screw, *j*, all arranged to operate substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ANDREW CAMPBELL.

Witnesses:
HENRY CONNETT,
ARTHUR C. FRASER.