

G. H. REYNOLDS.
LITHOGRAPHIC PRINTING PRESS.

No.. 37,727.

Patented Feb. 17, 1863.

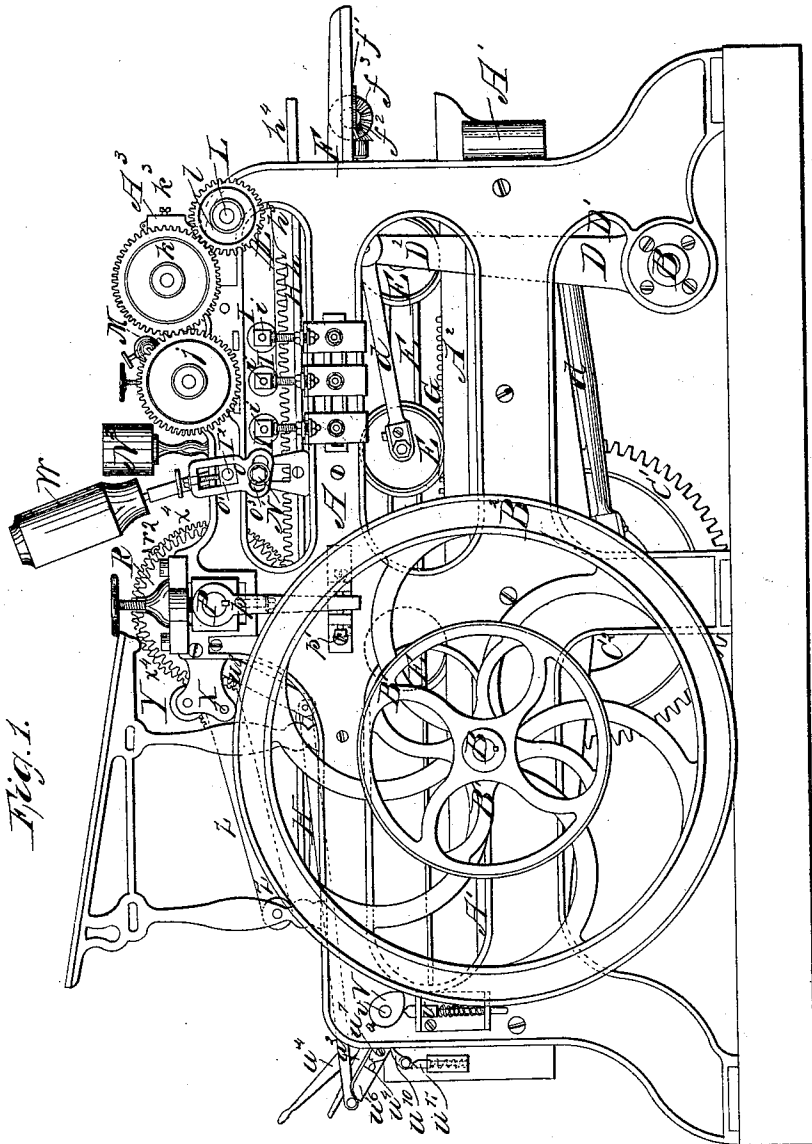


Fig. 1.

Witnesses:
G. H. Babcock

W. A. Hinduckton

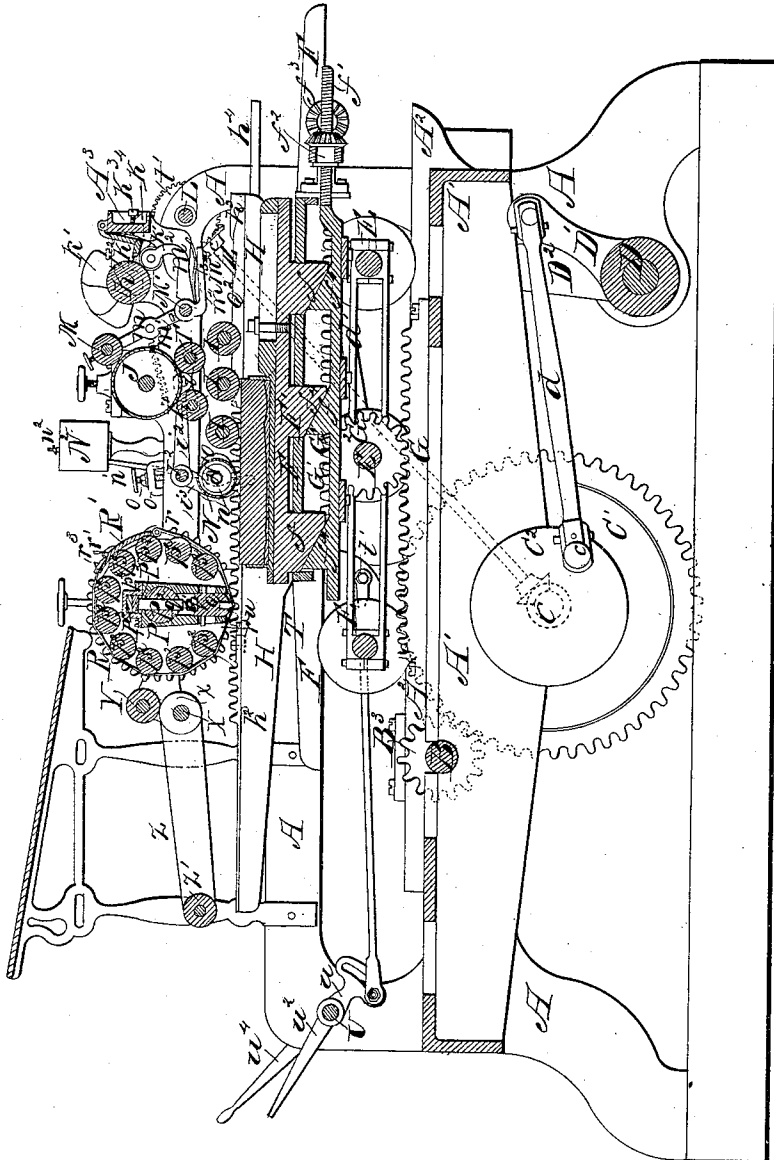
Inventor:
George H. Reynolds

G. H. REYNOLDS.
LITHOGRAPHIC PRINTING PRESS.

No.. 37,727.

Patented Feb. 17, 1863.

Fig. 2.



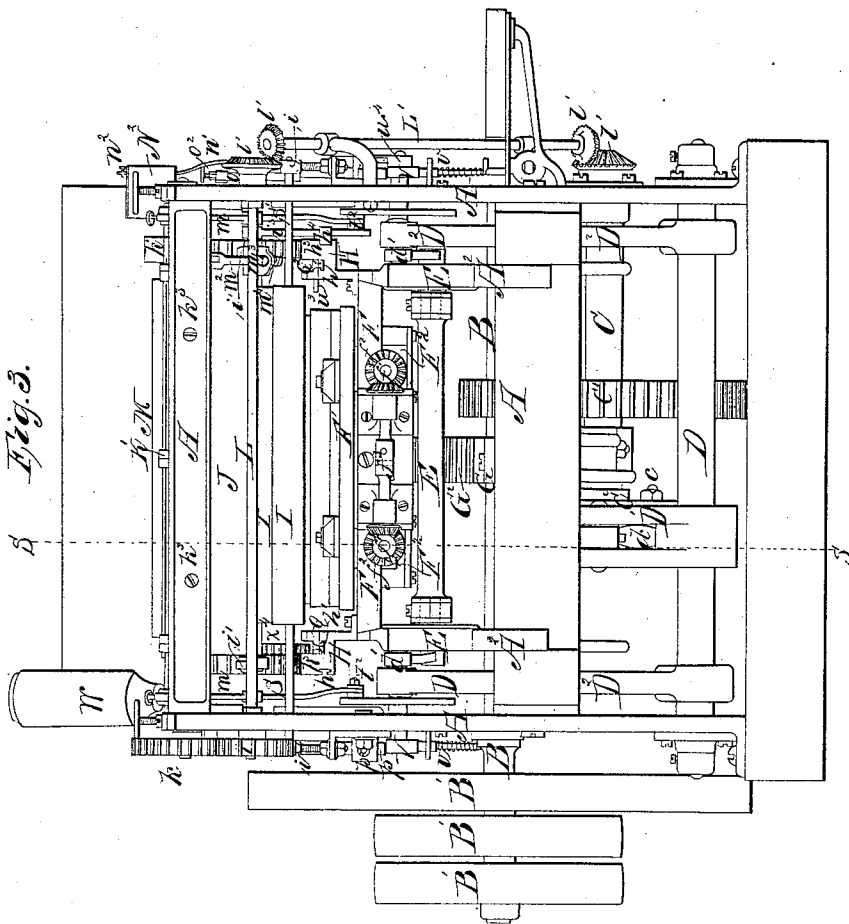
Witnesses:
G. H. Reynolds
A. H. Anderson

Inventor:
George H. Reynolds

G. H. REYNOLDS.
LITHOGRAPHIC PRINTING PRESS.

No. 37,727.

Patented Feb. 17, 1863.



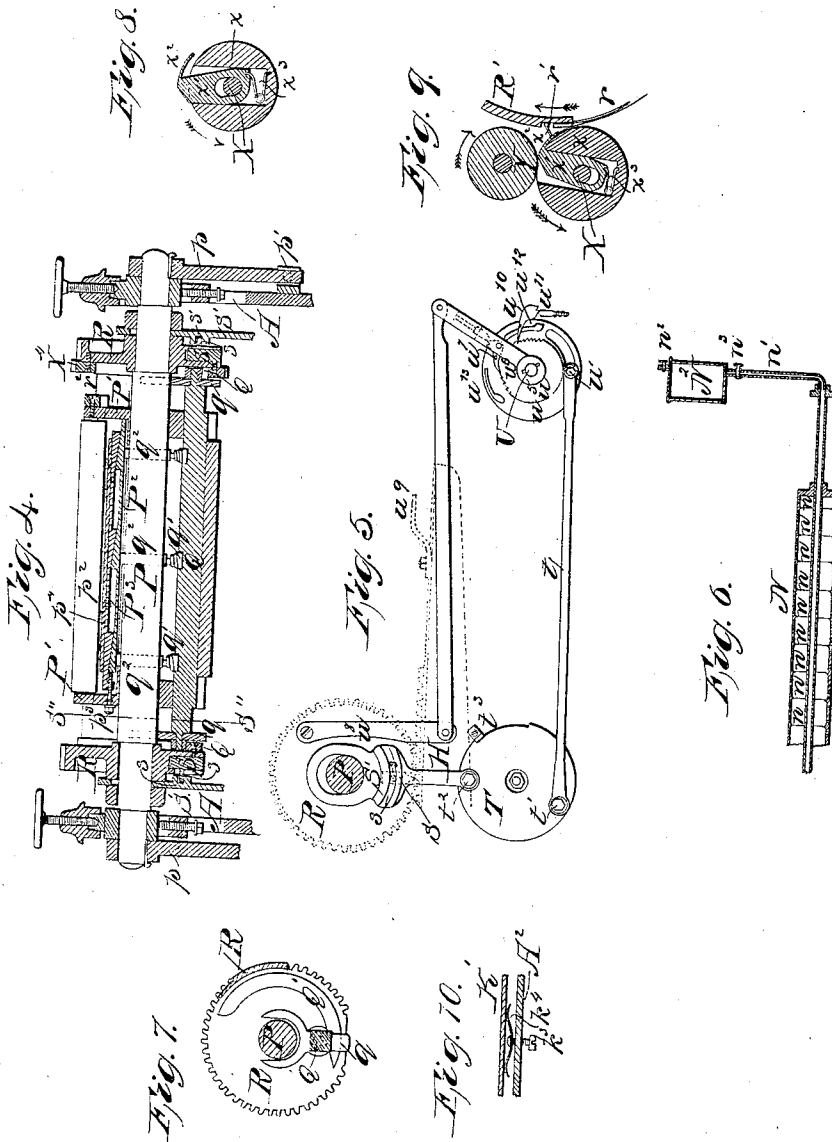
Witnesses:
G. H. Reynolds
W. A. Henderson

Inventor:
George H. Reynolds

G. H. REYNOLDS.
LITHOGRAPHIC PRINTING PRESS.

No. 37,727.

Patented Feb. 17, 1863.



Witnesses:
G. H. Reynolds
W. A. Henderson

Inventor:
George H. Reynolds

UNITED STATES PATENT OFFICE.

GEORGE H. REYNOLDS, OF NEW YORK, N. Y.

LITHOGRAPHIC-PRINTING PRESS.

Specification forming part of Letters Patent No. **37,727**, dated February 17, 1863.

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, of New York, in the county and State of New York, have invented certain new and useful Improvements in Power-Presses for Lithographic Printing; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved press. Fig. 2 is a vertical section, taken in the plane indicated by the line S S in Fig. 3. Fig. 3 is an end elevation. Fig. 4 is a longitudinal section of the part which answers to the cylinder in ordinary typographical printing-presses. Fig. 5 is a view of a portion showing the arrangement for throwing the tympan into gear with the bed, this arrangement being adjustable, so that the bed may be made to make any desired number of movements under the inking-rollers to each impression. Fig. 6 is a longitudinal section of the dampening-roller. Fig. 7 is a section on the line S' S' in Fig. 4. Figs. 8 and 9 are views of detached parts of the apparatus for removing the sheet, drawn to a larger scale. Fig. 10 is a detail section of a portion of the ink-fountain.

Similar letters of reference indicate like parts in all the figures.

Many parts of my press are similar in their structure and function to parts of presses previously known.

First, the nature of my invention consists in a certain arrangement of parts for giving motion to the bed; second, also in a certain construction of the dampening-roller; third, also in a certain combination of devices for raising and lowering the dampening-roller; fourth, also in the mode of controlling the admission of water to the dampening-roller; fifth, also in a certain combination and arrangement of parts for supplying ink to the inking-rollers; sixth, also in certain means of operating the duct-roller; seventh, also in certain means of adjusting the extent of contact between the fountain-roll and the duct-roller; eighth, also in a certain application of springs to the doctor of the fountain; ninth, also in a certain combination and arrangement of parts for adjusting the impression; tenth, also in the employment of certain lifting-pieces attached to the bed and adapted to lift the scraper at any

required portion of the stroke; eleventh, also in a certain combination of parts for stopping the tympan-frame always in one position; twelfth, also in certain means of starting the tympan-frame at the return-movement of the bed; thirteenth to fourteenth, fifteenth, and sixteenth, also in certain combinations and arrangements of parts for operating the said means of starting the tympan-frame at the proper time from the motion of the bed; seventeenth to eighteenth and nineteenth, also in certain combinations of parts for regulating the number of movements of the bed corresponding to each impression; twentieth, also in certain means of removing the sheet from the tympan after it is printed; twenty-first, also in certain means for securing accurate register.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation, by the aid of the drawings, and the letters of reference marked thereon.

A is the frame, of the proper form and material, to contain the parts and sustain the strains to which it is subjected. A' is a bed-plate, bolted fast to A and forming the principal tie or girt to the frame. A driving-shaft, B, is hung in proper bearings in A at the point represented. This shaft carries the driving-pulleys B', through which motion is received by means of a belt, (not represented,) a fly-wheel, B², and a pinion-gear, B³. Beneath the bed-plate A' is hung a short shaft, C, carrying a gear, C', which meshes into the pinion B³ and receives motion therefrom. One end of the shaft C extends out through the side frame, A, and the other end is supported by a bearing in the flange of the bed-plate, near the center thereof. Exterior to this bearing a disk or crank-wheel, C², is firmly fixed upon C, and carries a wrist-pin, c. Near the bottom of the frame A is hung a rock-shaft, D, which receives a vibratory motion through an arm, D', connected by a link, d, with the wrist-pin c on the crank-wheel C². At each end of D is fixed an arm, D², extending upward through slots in the bed-plate A'. Upon the bed-plate are fixed two rails, A³, and a six-wheeled truck, E, is fitted to traverse thereon, the wheels being provided with flanges to keep them upon the track. Links d' connect the shaft of the central pair of truck-

wheels with the arms D^2 , and through them the truck is caused to roll alternately back and forth to a limited extent upon the tracks A^2 . F is the bed of the press. It is made with two tracks on its under side, fitted to rest upon the wheels of the truck E , and run thereon, as represented. A rack, G , is fixed upon the center of the bed-plate A' , and a similar one, G' , is bolted to the under side of the bed F . A pinion, G^2 , is fixed upon the central shaft of the truck E , and adapted to mesh in both the racks G and G' . The pitch-circle of this pinion has the same diameter as the bearing-faces of the truck-wheels, so that the several parts roll together harmoniously without sliding friction. As the truck is caused to roll along its track A^2 , the bed F is compelled, by means of the racks and pinion G G' G^2 , to reciprocate with a velocity and extent of motion just double that of the truck, and with very slight friction. By this arrangement of parts the proper motion is given to the bed from a crank-shaft situated beneath the same, thereby rendering the machine very compact and convenient of access, at the same time that a smooth crank motion is imparted to the bed. The bed F is made in two principal parts, F and F' , one above the other. The upper part, F' , supports the stone, and has a series of projections f , extending down through holes in F . The under side of these projections f are beveled so as to form a series of inclined planes, as represented. Pieces F^2 , adapted to slide endwise within the bed F , are supported in stirrups depending therefrom, and are fitted with corresponding inclines f^4 , as represented. These pieces F^2 are adjusted by means of the screw f^1 and nuts f^2 . There are two of these pieces, F^2 with their screws and nuts, and they are caused to move together by forming bevel-gears upon the nuts and connecting them with a cross-shaft, f^3 , and match-gears, as is clearly shown in Fig. 3. The nuts f^2 and shaft f^3 are supported in brackets bolted to the bed F , and the nuts are prevented from having any end motion by means of collars, as shown in Fig. 2. The shaft f^3 is provided with holes or other suitable means of seizing and turning it at pleasure; and by its rotation the pieces F^2 and the beveled faces f^4 are equally moved. By this motion of the faces f^4 , under the faces f , the part F' is raised or lowered to allow of the use of a thicker or thinner stone. The impression may also be regulated by the same means, if desired, but I prefer to regulate this by means hereinafter to be described, and to use the inclines only as a means of regulating the height of the part F' of the bed. The stone is fixed upon the part F' by means of suitable clips, as represented. Upon each side of the bed F is bolted a piece, H , having racks thereon, as represented, and provided with dovetailed or undercut slots h h' , for receiving certain stops and bearers which will be hereinafter described. Above the bed, and so as to come in contact with the surface of

the stone, are three inking-rollers, I , supported in adjustable bearings i , and so arranged that the bearing pieces may be readily removed from the frame, and the rollers taken out for cleaning or any other purpose, and again be readily replaced. By means of the adjustable bearings i the pressure of the rollers I upon the stone may be regulated at will to suit the varying circumstances. Above the rollers I , and also hung in adjustable bearings, (not represented,) is a cylinder, J , which receives a constant rotary motion through the train of gearing j k l , the shaft L receiving its motion through an oblique shaft, L' , and bevel-gears l' , from the main shaft C . Between the rollers I and cylinder J are two other rollers, I' , hung in two pieces, i' , which pieces are hung upon the ends of two arms, i^2 , fixed upon a shaft, I^2 . These rollers I' are so fitted and hung that they may be caused to either lie in contact with the cylinder J , as represented, or be caused to assume positions intermediate between the rollers I and in contact therewith, the five rollers I and I' forming a train of rollers equivalent in their action to a train of gearing, the whole rolling together in harmony, and they assume either of these positions by rocking the shaft I^2 . This rocking motion is communicated to I^2 through an arm, i^3 , acted upon by stops h^2 h^4 , fixed in the slot h' in the piece H . A weight, W , is so fixed upon the shaft I^2 as to balance the weight of the rollers I' and their connections, and cause them to remain in either position indifferently. When the bed is at one extreme of its motion, the stop h^2 pushes against the arm i^3 and forces the rollers I' up against the cylinder J , and when the bed is at the other extreme of its motion the stop h^4 presses against the same arm and forces them down upon the rollers I . When the rollers I' are in contact with the cylinder J , they receive a supply of ink therefrom, and when they are placed in contact with the rollers I they impart the supply of ink to them, and in their turn the rollers I impart the ink to the design upon the stone. The cylinder J receives its ink from a fountain-roller, K , through a duct-roller, M , which is mounted in arms m , fixed upon a shaft, M' , and so arranged that by the rocking of M' the roller M may be brought alternately in contact with the cylinder J and the fountain-roller K . A spring, m' , tends to keep M always in contact with J , and it receives its motion in the other direction in the following manner: The fountain-roller K receives a continuous rotary motion through the gear k , and upon the shaft of this roller is mounted a cam, k' , which acts upon a roller in the arm m^2 upon the shaft M' , thus forcing M over against K and holding it in contact therewith while the two roll together to impart the ink to M . The length of time in which the two roll in contact is regulated by the length of the concentric portion of the cam k' . I make this cam with three divisions or steps, as represented, whereby the time of its action

upon the arm m^2 may be varied to three lengths by simply slipping the arm m^2 or the cam k' longitudinally upon their respective shafts. The arm m^2 is not rigidly fixed upon the shaft M' , but is loose thereon. A spring, m^3 , is attached thereto and rests upon a set-screw in the end of an arm or forked piece, m^4 , which is keyed to the shaft M' . By this arrangement the pressure of the roller M upon the roller K may be graduated very readily, being at all times equal to the tension of the spring m^3 . This is an essential point, as the proper taking of the ink from the roller K depends in a great measure upon the pressure of M thereon. The duct-roller M is fitted with an endless spiral and follower in the usual manner to give it reciprocating end motion, and thus secure an even distribution of the ink. The fountain is composed of the roller K and an L-shaped piece, K' , hinged to the girt A^3 of the frame A , and forced in contact with the roller K by set-screws K^3 passing through A^3 . These set-screws bear against springs k^4 , (shown more plainly in Fig. 10,) which springs bear against the piece K' , thus allowing it to yield to any inequality or eccentricity of the roller K , and thereby secure an even film of ink thereon. As it is difficult to construct the roller K perfectly true or to keep it so, owing to the wear of itself and its bearings, these springs k^4 are important in securing an even supply of ink. The piece K' is grooved out on its edge and a doctor fitted therein, as represented, which may be replaced when worn. The ends K^2 of the fountain are removable, and may be moved nearer to or farther from the center, in accordance with the size and position of the design upon the stone.

Immediately forward of the inking rollers I is another roller, N , for dampening the stone before inking. The construction of this roller is more plainly shown in Fig. 6. It consists of a hollow shell or tube, N , on the interior of which are a series of annular flanges, n , with holes through the shell between these flanges, as represented. This shell surrounds a smaller tube, N' , which acts as a shaft or axis for the roller, and is supported in sliding bearings so that it may be lowered or raised to a limited extent. This tube N' is pierced with holes between the flanges n , as represented, and is connected at one end by a packed joint with a tube, n' extending upward to a fountain, N^2 . This fountain has an air-tight cover, and is fitted with a small cock, n^2 , therein for the admission of air. Another cock, n^3 , is placed in the pipe n' , as represented. The exterior of N is covered with felt or other porous material. On water being poured in the fountain N^2 , and the cocks n^2 and n^3 opened, it flows into N' and out through the holes therein into N and through the holes therein, wetting the covering of felt. The amount of water thus flowing into N may be regulated by the cock n^3 , but is much better regulated by the cock n^2 , the admission of air to the vessel N^2 controlling,

in the well-known manner, the exit of water therefrom.

The flanges n serve the important purpose of equalizing the moisture in the covering of N in the following manner: Water stands in the tube N' , and at the holes therein, ready to drop the instant sufficient air is let into the fountain, when a drop exudes from each hole and falls into the recesses between the flanges n . As the roller N is revolved by the action of the press this water cannot at once run through the holes therein, but a little time elapses before it escapes, during which time it describes circles or spirals on the interior of N . If the roller N or the press stands inclined from the horizontal, as will nearly always be the case, (more or less,) there would be a tendency in the water to run toward the lower portion, and what did not escape very soon through the pores would do so, thus creating an excess at the lower end with a corresponding limited supply at the higher. By reason of the flanges n this condition cannot obtain in my improved roller, because all the water which falls between two flanges must of necessity escape through the pores between those flanges, and the moisture is thereby practically equalized. By this means and the employment of atmospheric pressure to regulate the supply of water, the amount of moisture may be very delicately adjusted to the requirements of the work in hand, which is an essential point in nice lithographic printing. It is necessary that the stone be damped before being inked, but not between the inking and the impression, and to accomplish this object I cause it to be lifted out of contact with the stone on the return-movement of the bed after the ink has been received. This is done as follows: On each end of the shaft I^2 , which extends through the frame for that purpose, is fixed an arm, O , so constructed that while it is caused to turn with the shaft its effective length may be increased or diminished by means of the sliding box o' and screw O^2 . These arms O have cam-shaped slots O^3 , which receive rollers fitted on the axial tube N' of the roller N . The shaft I^2 being rocked at each extremity of the motion of the bed, as before described, the cam-shaped slots O^3 alternately raise and lower the roller N out of and into contact with the stone in the obvious manner. The amount of pressure exerted by the roller N upon the stone is regulated by the screws O^2 , and may be varied at pleasure to suit the requirements of the work in hand.

I will now describe the devices for conveying the paper to and from the stone and giving the impression. In the frame A , at the point represented, is hung a shaft, P , in adjustable boxes, so that it may be raised or lowered as required. This shaft is fixed or is not capable of revolving, but is capable of a slight adjustment by means of the arms p and set-screws p' . Fixed upon this shaft are two heads, P' , between which are a series of anti-frictional rollers, p^2 , forming a sort of cylinder

for distending the tympan-sheet in the same manner as in some previous presses. In slots in the bottom of these heads P' , and extending beyond the said heads, is the scraper-bar Q , of the form represented. This bar is adapted to receive a slight vertical motion in the heads P' , and is forced downward upon the stone by means of springs q' , which have their bearing against pins q^2 , passing through the shaft P , as represented. A piece, P^2 , having a series of inclined faces, rests upon the top of the pins q^2 , and a similarly-shaped piece, P^3 , is placed upon P^2 and is fitted to have an endwise motion, which is communicated by means of the screw p^3 . A box, p^4 , surrounds these pieces P^2 and P^3 and prevents their rising, so that when the piece P^3 is moved endwise, by means of the screw p^3 , the tension of the springs q' is increased or diminished at pleasure.

Exterior to the heads P' , and fitted to turn loosely upon the shaft P , are two gear-wheels, R , fitted to mesh into the racks upon the pieces H on the bed and to receive motion therefrom. The tympan-frame R' is bolted to these gears and revolves around the rollers p^2 , carrying with it the tympan r and grippers r' , the grippers being opened to receive the sheets at the proper time by a cam, r^2 , on the head P' . Points r^3 are placed in the tympan-frame to place the sheet upon for more accurate register. By placing these points upon the revolving tympan-frame, instead of connected with the feed-board, as is usually done, the register is independent of the accurate stopping of the cylinder, and consequently independent of the speed of the press. This is important in printing in colors or where nice register is required.

In order to lift the scraper Q for the passage of the tympan-frame R' beneath, and for the return-movement of the bed, cams Q' , Fig. 7, are attached to the wheels R and act on the rollers upon the end of the scraper-bar, the said cam being arranged so as to lift the scraper just before the bed completes its forward movement, and drops it again immediately after the grippers and tympan-frame have passed. This arrangement is common to previous presses, but it necessitates the action of the scraper during the whole width of the stone, even if the design covers but a small portion, thereby requiring more power and a greater wear upon the tympan and other parts than would be necessary to do the printing required. To avoid this I employ adjustable lifting-pieces Q^2 , attached to the pieces H on the bed by headed bolts sliding in the slot h . These pieces Q^2 may be adjusted to lift the scraper Q at any desired point of the motion of the bed by acting upon projections q , provided for that purpose, and hold it up until the cams Q' come into action. When a small design is put upon a large stone, as may frequently be convenient, by adjusting these pieces Q^2 to the right point only that portion of the stone containing the design receives the impression, and the power required or the wear of the press is the same as if a small stone were used. It may some-

times be desirable to print two or more designs upon one stone at a distance apart, and by using pieces Q^2 of a proper length the pressure of the scraper upon the stone may be relieved between the designs, if desired; or, if two designs are upon the same stone and it is desired to print from only one of them, the lifting-pieces Q^2 may be made to relieve that portion of the stone on which the undesired design is situated from the pressure of the scraper, and consequently from the impression. It is necessary that the tympan-frame R' should revolve only in the forward direction, and that it remain stationary during the return-motion of the bed, and in order to accomplish this object I employ the following mechanical devices: The wheels R have a portion of one side cut off in the line of a cord of the circle, so that when that side is down, or the cord parallel with the bed, the rack-pieces H may slide underneath R without gearing therewith, as represented in red in Fig. 5. There are the same number of teeth in the wheels R that there are in the racks H , so that when they are in gear the movement of the bed causes R to turn just one revolution, but the entire motion of the bed is a little greater than the circumference of R or the length of the racks H , and the end of H beyond the teeth is formed into a plane, h^3 , slightly higher than the points of the teeth, and with a short incline leading thereto, as represented. As the bed moves forward and the wheels R revolve, the plane portions of the said wheels come in contact with these planes h^3 , and thus stop the further revolution of R , and as the bed moves on a little distance these planes h^3 , with their inclines, compel the wheels R to turn sufficiently for the plane h^3 to pass under the plane portions of the said wheels, and thus they are brought always to the same point, whether the press be moving fast or slow. If the press be moving fast, the momentum of R will tend to cause it to move too far, and it will then be checked by the planes h^3 ; but if the press is moving slowly and the momentum of R is not sufficient to overcome its friction, then the last portion of its movement will be completed by the inclined approaches to the planes h^3 , as above described. In either case the wheels R must come to a position where the planes h^3 just coincide with the secant-plane of their flattened side, and it is evident that they can in no case, when the parts are properly adjusted, pass beyond this position. As the planes h^3 are higher than the points of the teeth of the racks H , it is obvious that on the return-movement these teeth pass without engaging the wheels R , and that they will continue to pass back and forth thus until some means be employed to cause them to engage. I accomplish this by the following novel means: In each of the wheels R , in the line of the radius perpendicular to the secant-plane, I form a slot and fit therein a sliding piece of metal, S , so formed that when projected to the proper distance it shall constitute one tooth of the

wheel, corresponding in position with a tooth which would have been there had the wheel been complete or not flattened on that side. At the side of the wheels R and exterior thereto are movable pieces, S', Figs. 4 and 5, which embrace the shaft P, but may be moved up and down thereon. These pieces S' have curved slots, s', which receive pins s, projecting from the sliding teeth S, as represented, and they extend downward and take hold of wrist-pins t^2 in the face of disks T, which turn loosely on studs fixed in the frame A. By turning these disks T the pieces S' may be moved up and down, and consequently the sliding teeth S into and out of the wheels R. When the teeth S are thus moved out they engage the racks H, and thus motion is communicated to the wheels R and tympan-frame, but when the sliding teeth S are withdrawn into their slots the bed travels back and forth without giving any impression. The disks T are oscillated at the proper time, to give the required motion to the teeth S, by the following mechanism: A shaft, U, is hung in the frame A at the point represented. At either end of this shaft, within the frame A, is keyed an arm or disk, u , having a concentric slot therein subtending an angle equal to the angular motion required for the disk, t . From a stud, u' , playing loosely in this slot, a connection, t , extends to a wrist-pin, t' , in the bottom of the disk T. On the end of the shaft U, and exterior to the frame A, are two pointed cams, V, which act against spring-bars v , the cam compressing the spring on v until it passes the point, when the recoil of the spring tends to continue the motion of the cam in the obvious manner. An arm, u^2 , is also keyed to the shaft U and adapted to be operated by an adjustable stop or stud, u^3 , on the piece H, Fig. 2, and a hand-lever, u^4 , is also keyed to the same shaft to enable it to be worked by hand when desired. Next to the disk u , Fig. 5, a ratchet-wheel, u^5 , is fixed, and an arm, u^6 , is fitted to turn loosely on the shaft U, immediately adjacent thereto. This arm u^6 carries a pawl, u^7 , which is adapted to work in the teeth of the ratchet-wheel u^5 , as represented. A lever, u^8 , is hung on the frame A and adapted to be struck by an adjustable stud, u^9 , on the piece H, and a link connects this arm with the ratchet-lever u^8 , as represented, so that motion is communicated to the shaft U by this train of levers from the bed F. The rack-piece H hits the lever u^8 on its forward movement, pressing it down after it has been lifted through the lever u^8 and studs u^9 on the previous motion of the bed. A retaining-pawl, u^{10} , prevents the return of U in the ordinary manner. When the shaft U is revolved into the position shown in Fig. 5, the slot in u has been moved so that its end strikes the stud u' , and any further movement of U will cause corresponding motion in the disk T, piece S', and sliding tooth S. In this position the point of the cam V is just on the spring-bar v , and a slight motion farther will permit the spring

bar v to throw the shaft U through the remainder of its stroke, and thus protrude the teeth S, so that they will engage the racks H. It will be observed that this action must take place while the bed is at its extreme stroke under the inking apparatus, because the stud u^9 is so situated that it must actuate the lever u^8 and through that the shaft U while the bed is in that position, and as soon as it has moved the shaft U to a sufficient extent to pass the point of the cams V over the spring-bars v , the springs on v immediately cause the teeth S to protrude. As this is done the cam-piece u^{12} , on the disk u , lifts both pawls u^7 and u^{10} by means of pins which project therefrom from the teeth of the ratchet-wheel u^5 . These pawls are held in contact with the said teeth when in action by means of sliding spring-bars u^{11} , acting on inclines on the said pawls, as will be seen in Fig. 1. These same spring-bars tend also to hold the pawls out of contact with the said wheel when lifted by the cam u^{12} by entering notches therein, in a manner familiar to mechanics. The shaft U is therefore now free to revolve in the opposite direction, and when the bed has nearly made its forward movement, carrying with it the wheels R, the stud u^3 strikes the lever u^2 and turns U in the opposite direction, but such motion does not affect the disks T and teeth S until it has moved the distance of the slots in u . As these slots are equal to the angular motion of T, it follows that by the time T commences to move the cams V have come into position where they are thrown forward by the sliding spring-bars v , and the entire motion of T and consequently of S is given by said springs. The stud u^3 is set in such a position that this movement is made at just the right time to disengage the teeth S from the racks H at the proper point, which is just previous to the completion of the revolution of the wheels R. When the shaft U revolves in this direction, the cam u^{13} on the disk u , Fig. 5, strikes the pin in the pawl u^7 and forces it down into the teeth of the ratchet-wheel u^5 , thus compelling the arm u^6 to move with the shaft U, and this arm strikes the pawl u^{10} at the end of the motion of U, and closes that also upon the teeth of u^5 , when the parts are again ready to turn the shaft U in the opposite direction. The stud u^9 may be so set as to turn the shaft U the proper distance to protrude the teeth S at one motion of the bed, or it may be set so as to move it only a part of such distance, and thus require several motions of the bed to each impression. This is an important feature, for it is necessary in doing fine work that the form should receive a large amount of rolling in order to properly distribute the ink. By my improved arrangement the amount of rolling to each impression can be regulated to any desired degree of nicety, and made entirely automatic by simply adjusting the stud u^9 . The pressman may at any time cause an impression to be taken, or prevent such an action, by turning the shaft U by means of the

hand-lever u^4 , which is conveniently placed for that purpose. Stops t^3 , attached to the frame, prevent the momentum of the disk T from carrying it beyond its proper position.

The means for removing the sheet from the tympan after it is printed are peculiar, and are as follows: Behind the tympan-cylinder, and supported in bearings attached to the frame, is a shaft, X, carrying a number of pulleys, x , which run in close proximity to the tympan-frame R' , when the latter is in that part of its revolution. The size of these pulleys is such, and they are so geared with a wheel, x^4 , fixed upon one of the wheels R, as represented, that their surface velocity is exactly equal to that of the tympan, and the two roll together without friction, or would if they came in actual contact. Two or more of these pulleys, x , are constructed in the manner shown in Figs. 8 and 9, which are on a larger scale than the other figures. A mortise is made in the pulley as represented, and a piece, x' , fitted therein, which is narrower than the slot, and has a play in the plane of the revolution, and also a slight end play in addition thereto. On the exterior of the piece x' is fixed a thin curved piece of steel, x^2 , extending over the solid portion of the pulley x and in the direction the reverse of the motion of the pulley, the arrow indicating the direction of the motion. A spring, x^3 , tends to keep the piece x' always in the position represented in Fig. 8 at the forward part of the slot, and protruded from the pulley. In a proper position over the shaft X is another shaft and cylinder or roller, Y, running in contact with X, and driven thereby, so that when x' comes under the roller Y it is first held stationary while the wheel x revolves until it has traversed the width of the slot, when x' is forced under Y, thus closing the finger x^2 down upon the surface of x . The forward edge of x is beveled to facilitate this action. The shaft X is so geared to the wheel R that the fingers x^2 in their revolution come just above the edge of the sheet as it is held in the gripper r' , (see Fig. 9,) and recesses are provided in the tympan-frame for their reception. As the parts arrive at this position the piece x' strikes the roller Y, and is thereby arrested in its motion, while the tympan, the sheet of paper, and the wheel x continue their motion. This causes the fingers x^2 to be inserted between the sheet and tympan-frame, and when they are compelled to pass under Y they are pressed down upon x , thus holding the sheet fast. At this instant the grippers r' are opened and release the sheet from the tympan, and the fingers x^2 carry it between x and Y. As soon as the fingers x^2 pass from underneath the roller Y, the spring x^3 opens them and releases the sheet, but it is held by the pressure between x and Y and is compelled to move therewith. Endless tapes or bands z extend from the pulleys X to a cylinder, Z' , and the sheet is carried off thereon in the usual manner, and may be piled by hand or by the ordinary "fly,"

Operation: I have described the operation of most of the parts in connection with explaining their construction, but I will now proceed to describe the general operation of the machine, or the manner in which the printing is accomplished in the order of the successive stages thereof. Motion being communicated to the press by proper means, the bed F is caused to reciprocate upon the truck E, the stone having been placed upon the part F' and secured in its proper position with the front edge so placed that it will bring the edge of the design at the proper distance from the grippers to secure the required margin upon the sheet, and then adjusted to the proper height to receive the ink and impression by means of the pieces F^2 and screws f' , as before described. As the bed reciprocates, the stone first passes under the dampening-roller N, where it receives the proper degree of moisture, and then under the inking-rollers I, where it receives the ink. The manner in which the ink is supplied to the rollers I has been before fully explained. At the end of the motion of the bed in that direction the stud or stop h^2 strikes the lever or arm i^2 and lifts the dampening-roller N through the cam-shaped pieces O, so that the stone on its return-motion does not come in contact therewith. The inking-rollers, however, continue in contact and roll across the stone on the return-movement. So long as the shaft U is not revolved so as to bring into action the sliding teeth S, the bed continues to reciprocate without giving an impression, passing under both the dampening-roller and the inking-rollers at each forward movement and under the inking-rollers only on the return-movement, and thus any desired amount of rolling may be given to the stone. While this is going on the pressman places the edge of a sheet from the pile upon the feed-boards under the grippers r' , which are open in this position, and presses it upon the points r^3 , so as to receive the proper "register." He then either operates the shaft U, by means of the hand-lever u^4 , or adjusts the stud u^3 so as to cause the reciprocation of the bed to operate, as before described, to project the teeth S and thereby cause the tympan-frame to rotate with the bed, carrying with it the sheet, the grippers closing immediately the cylinder starts, the points r^3 insuring that the sheet does not slip before the grippers take. As the cam Q' passes from under the scraper Q the latter presses the tympan and sheet upon the stone in the ordinary manner and gives an impression of the design thereon. As the tympan-frame continues to revolve the fingers x^2 remove the sheet therefrom, as above described. The lifting-bearers Q^2 , being properly adjusted in the slots h , lift the scraper Q immediately after the design has passed, thus relieving the tympan from further friction therefrom and hold it up until the cams Q' have come into play. The tympan having made a complete revolution it is stopped and brought to its position by the

planes h^3 , as above described, and the stop u^3 has operated upon the lever u^2 , and thus reversed the sliding teeth S, so that the return-movement of the bed does not engage the wheels R, all of which has been above fully described. On the next forward movement of the bed the stone is dampened by the roller N, and receives ink from the rollers I, and the whole operation is again repeated, the number of times which the bed passes under the rollers to each impression being regulated, according to the quality of the work, by adjusting the stop or stud u^9 .

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

1. The employment of the flanges n on the interior surface of the dampening-roll N, in connection with alternate holes in the water-tube N', substantially as and for the purpose specified.

2. The combination of the cam-shaped pieces O, shaft I², arm i^3 , and studs h^2 and h^4 , with the dampening-roll N, substantially as and for the purpose specified.

3. Controlling the admission of water to the dampening-roller N of the lithographic press by means of atmospheric pressure, substantially as herein described.

4. The combination and arrangement of the rollers I', shaft I², balance-weight W, arm i^3 , and studs or stops h^2 h^4 , for the purpose of transferring the ink from the cylinder J to the inking-rollers I, substantially as herein described.

5. The combination of the arm m^2 , spring m^3 , forked arm m^4 , and duct-roller M, substantially as and for the purpose set forth.

6. The combination of the multiple cam k' , fountain-roller K, arm m^2 , and duct-roller M, arranged substantially as described, and for the purpose specified.

7. The employment of the springs k^4 , between the set-screws k^3 and the fountain-trough K', for the purpose above set forth.

8. The combination and arrangement of the inclines P² P³, pins q^2 , springs q' , and scraper Q, for the purpose of adjusting the pressure upon the scraper, substantially as herein described.

9. The combination of the wheels R, having one flattened side, with the planes h^3 , for stop-

ping the tympan-frame in the proper position, as herein described.

10. The employment of the sliding teeth S, in combination with the flattened wheels R and rack H, substantially as described, for the purpose of causing the wheels R to engage the said racks after having been stopped.

11. In combination with the sliding teeth S, the adjustable slotted pieces S', for operating the said teeth, substantially as herein specified.

12. In combination therewith, the disks T, wrist-pin t^2 , and stops t^3 , for operating and controlling the said pieces S'.

13. The combination of the slotted arms or disk u , shaft U, cams V, and sliding spring-bars v , or their respective equivalents, for operating the disks T, substantially as herein set forth.

14. The combination of the shaft U, levers u^2 and u^4 , and the studs u^3 and u^9 , attached to the reciprocating bed F, for the purpose of operating the shaft U, and consequently the sliding teeth S, from the reciprocations of the bed F, substantially as herein described.

15. The ratchet-wheel u^5 , and pawls u^7 and u^{10} , in combination with the shaft U, lever u^6 , and adjustable stop or stud u^9 , for the purpose of regulating the number of movements of the bed to each impression, substantially as set forth.

16. The cam u^{12} , for lifting the pawls u^7 and u^{10} out of contact with the teeth of the ratchet-wheel u^5 , in combination with the said ratchet-wheel, to cause the return-motion of U, substantially as herein described.

17. The cam u^{13} , in combination with the pawl u^7 , lever u^6 , ratchet-wheel u^5 , and retaining-pawl u^{10} , for bringing the said pawls into action, substantially as above set forth.

18. The arrangement of the pulleys x , spring-pieces x' , fingers x^2 , and roller Y, for removing the sheet from the tympan, substantially as specified.

19. The employment of the registering-points r^3 in the revolving tympan-frame R', for the purpose above set forth.

GEORGE H. REYNOLDS.

Witnesses:

W. A. HENDRICKSON,
G. H. BABCOCK.