4 Sheets--Sheet 1.

J. T. & F. ASHLEY

Paper-Feeding Machines.

No. 143,740. Patented Oct. 21, 1873.

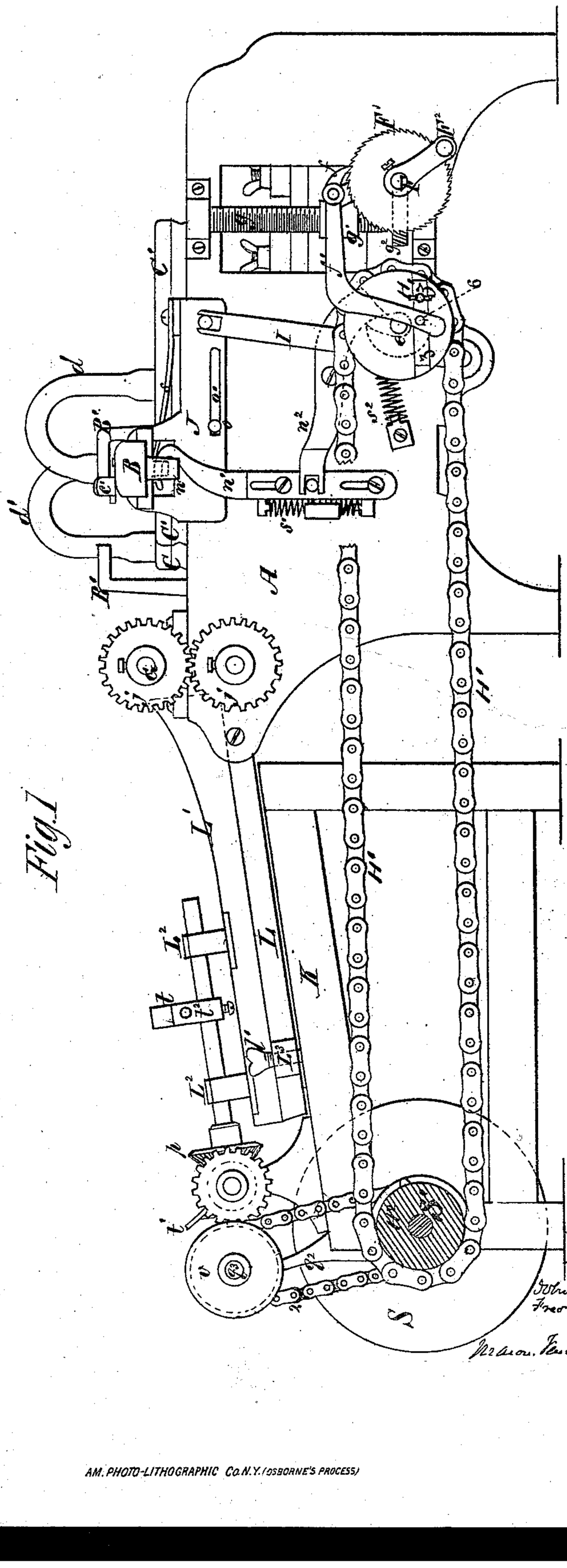

Fig. 1

Witnesses.
R. F. Campbell.
Jos. Campbell.

Inventors
John T. Ashley
Fred'k Ashley
by
Mason, Fenwick & Lawrence

4 Sheets--Sheet 2.

J. T. & F. ASHLEY

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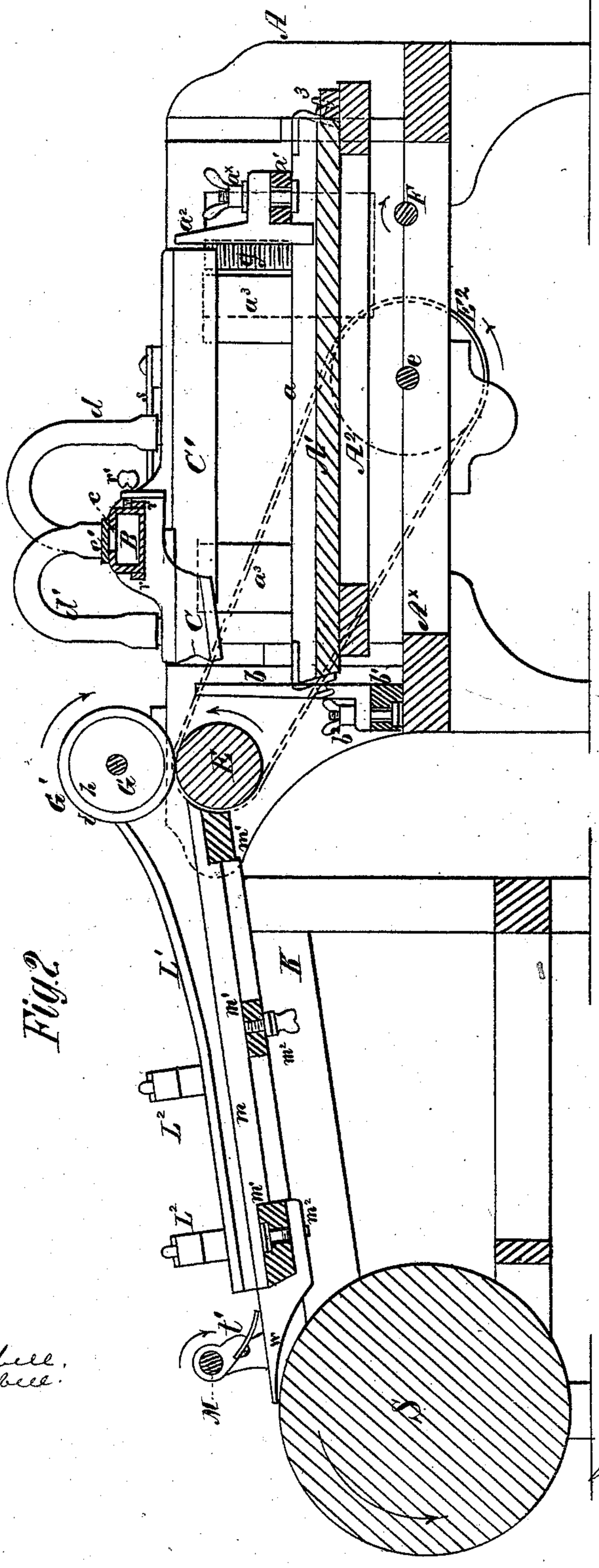

Fig. 2

Witnesses.
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4 Sheets--Sheet 3.

J. T. & F. ASHLEY

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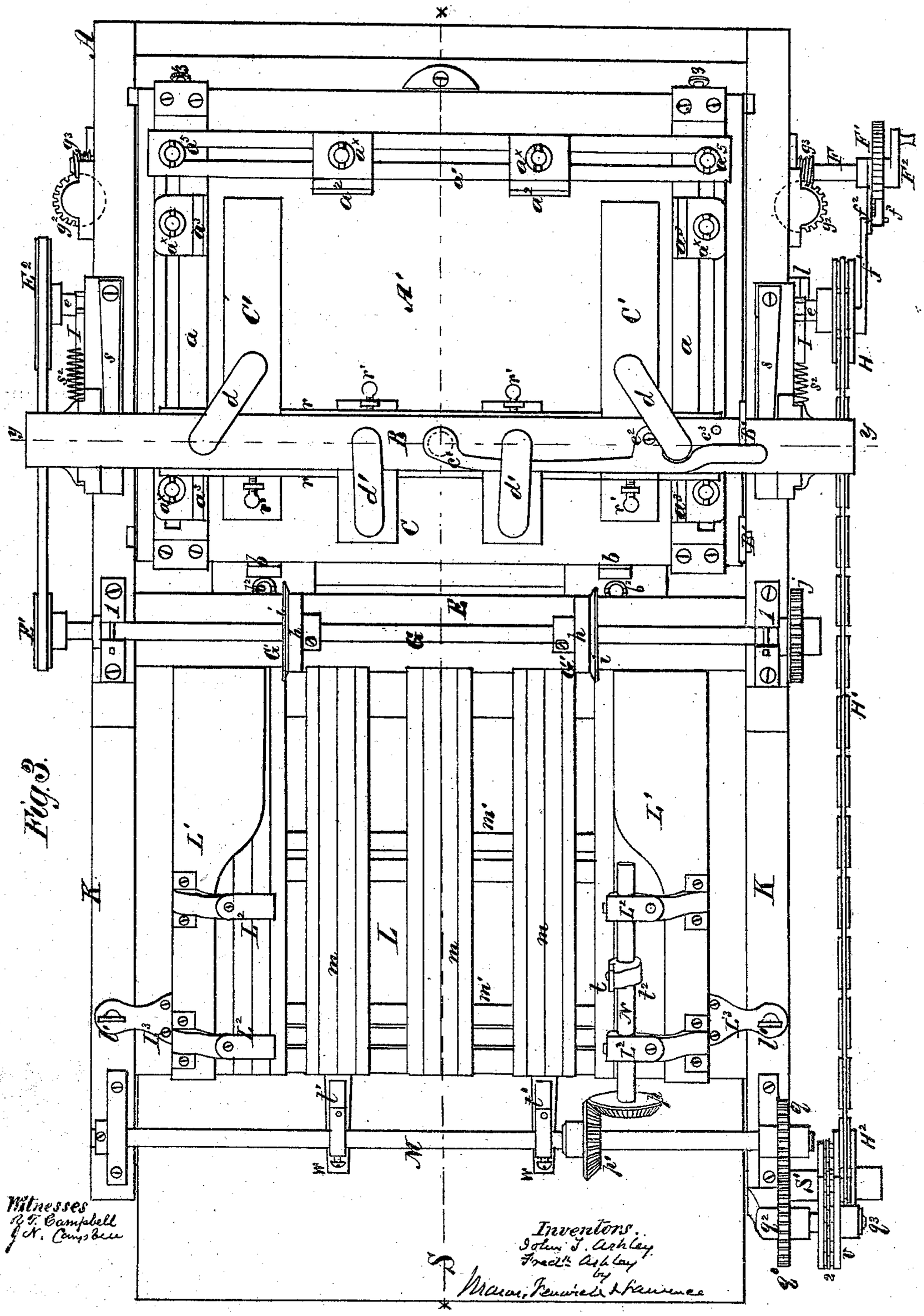

Fig. 3.

Witnesses
R. T. Campbell
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John T. Ashley.
Fred'k Ashley
by
Munn, Pennie & Lawrence

4 Sheets--Sheet 4.

J. T. & F. ASHLEY

Paper-Feeding Machines.

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Fig. 4

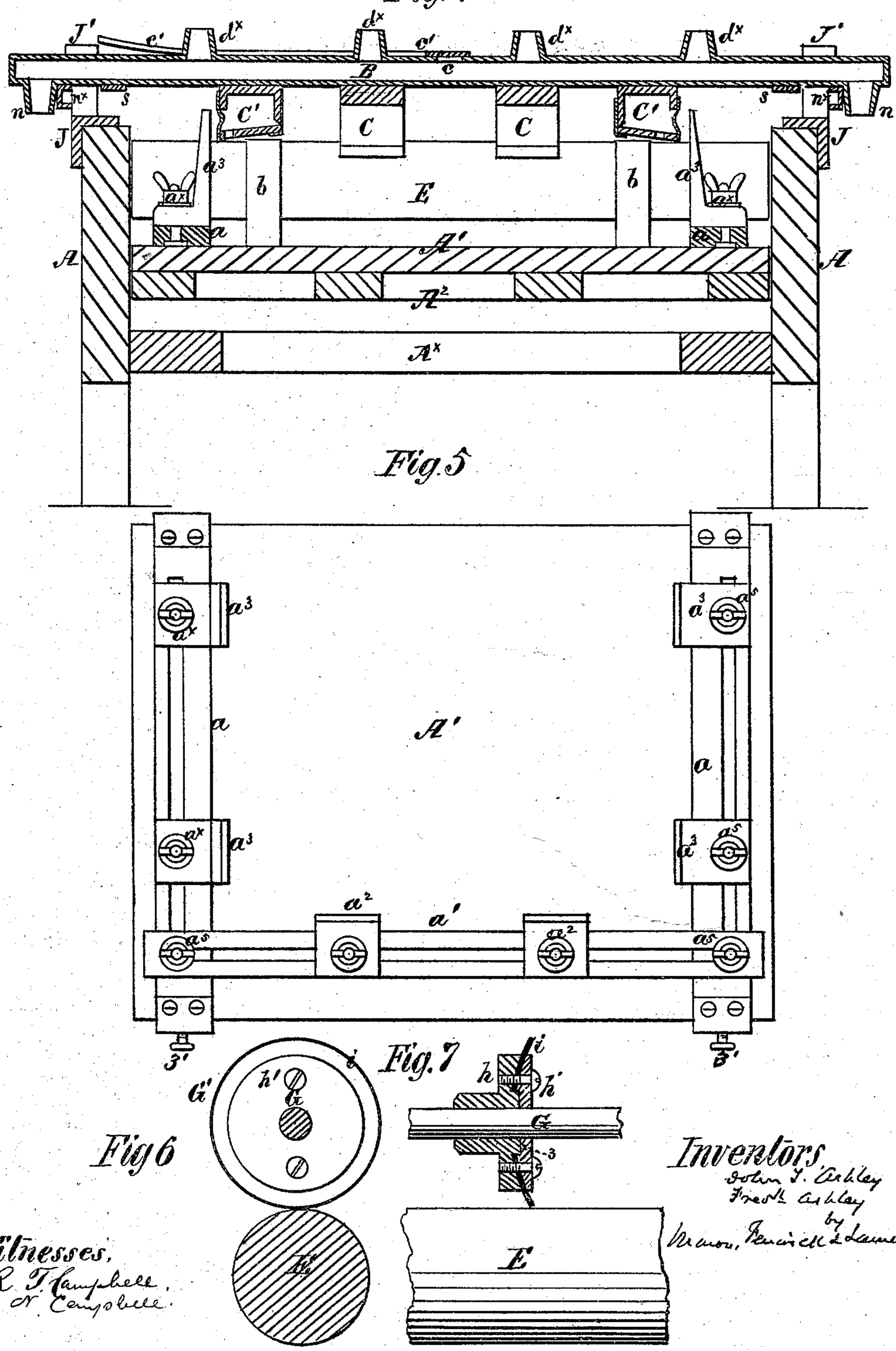

Fig. 5

Fig. 6

Fig. 7

Witnesses,
R. T. Campbell.
F. A. Campbell.

Inventors
John T. Ashley
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by
Munn, Pennie & Lawrence.

UNITED STATES PATENT OFFICE.

JOHN T. ASHLEY AND FREDERICK ASHLEY, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN PAPER-FEEDING MACHINES.

Specification forming part of Letters Patent No. **143,740,** dated October 21, 1873; application filed May 24, 1873.

To all whom it may concern:

Be it known that we, JOHN T. ASHLEY and FREDERICK ASHLEY, of Brooklyn, E. D., in the county of Kings and State of New York, have invented a new and Improved Paper-Feeding Machine; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings making part of this specification, in which—

Figure 1, Plate 1, is an elevation of one side of our improved feeder. Fig. 2, Plate 2, is a section taken vertically and longitudinally through the center of the feeder, as indicated by the dotted line *x x* in Fig. 3. Fig. 3, Plate 3, is a top view of the feeder. Fig. 4, Plate 4, is a section taken vertically and transversely through the feeder in the plane indicated by the dotted line *y y* in Fig. 3. Fig. 5, Plate 4, is a top view of the movable tray detached from the feeder. Figs. 6 and 7, Plate 4, are views of the upper and lower discharging devices.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to certain novel improvements which are designed for picking up sheets of paper from a pile, one sheet at a time, moving the sheets forward upon a feed-board, smoothing the sheets to a printing-press, ruling-machine, or to any other machine requiring to be fed with sheets of paper one sheet at a time.

Our object is not only to pick up the sheets singly and deliver them in a proper manner to printing-presses and other machinery, but also to so construct the feeder that the picking-up and feeding devices, as well as the supports for the pile of paper and the single sheets taken therefrom, are all adjustable and adaptable for sheets of different sizes, as will be hereinafter explained.

The following description of our improvements will enable others skilled in the art to understand it.

In the accompanying drawings, A $A^{\times}$ represent the vertical and horizontal portions of the frame which support the pile-table A^2, the picking-up devices, and the devices which discharge the single sheets; and K represents the frame which supports the feed-board and its attachments, and also the impression-cylinder S, of a printing-press. Above the horizontal portion $A^{\times}$ of the frame A is a horizontal rectangular table, A^2, which has vertical guides at its four corners, and which is connected to two vertical screws, *g g*, by means of brackets g^1. This table A^2 is for the purpose of supporting a tray, A^1, on which is placed the pile of paper from which the sheets are fed; consequently it is necessary that the table should be slowly and regularly raised as the sheets are successively taken from the pile. To this end I key on the lower end of each screw *g* a toothed wheel, g^2, with which engages a worm-screw, g^3, on a horizontal shaft, F, as shown in Fig. 3. This shaft F has its bearings in the vertical cheeks of the frame, and on one end of it is a ratchet-wheel, F^1, and a hand-crank, F^2. With the ratchet-wheel engages a pawl, *f*, which is pivoted to the ends of arms f^1 f^2. The arm f^2 vibrates freely on the shaft F, and the arm f^1 is connected eccentrically by a wrist-pin to the face of a chain-wheel, H, as shown in Fig. 1. The wrist-pin 6 is secured to a slide, *z*, on the face of the wheel H, by means of a set-screw, *z'*, which, with gage-marks and a pointer, enables us to adjust for raising the pile of paper more or less rapidly, according to the thickness of the sheets used in the feeder. The chain-wheel H is keyed on one end of a horizontal transverse shaft, *e*, on the opposite end of which shaft is keyed a pulley, E^2. (Shown in Figs. 2 and 3.) Around the wheel H passes an endless-chain belt, H^1, which is carried along outside of the frames A and K, and passed around another chain-wheel, H^2, which is keyed on the shaft S' of the impression-cylinder S. The peripheries of the two chain-wheels are grooved and provided with lugs, which positively prevent the belt H^1 from slipping. By these means motion is transmitted positively from the shaft of the impression-cylinder S to the two screws *g g*, which raise and depress the table A^2, and the intermittent upward impulses given to this table can be accurately timed with respect to the movements of the said impression-cylinder. The upward movements given to the table A^2 must necessarily be regulated according to the thickness of the sheets being fed, and the extent of these movements may be regulated by the movable wrist-pin 6, or by a suitable adjustment applied to the pawl-actuating devices. The hand-crank F^2, above referred to, is for the purpose of rapidly running down the table A^2 and adjusting it for piles of different heights, which can be

done by disengaging the pawl *f* from the ratchet-wheel F.

It will be seen that the mechanism which moves them is arranged outside of the frame A, which arrangement leaves the space beneath the table A^2 free from the fly of the press and the flying sheet, and also enables us to work the entire length of screws, which extend above the highest plane to which the table is moved.

A^1 represents the tray in which the pile of paper is placed and properly adjusted. This tray, which is shown by Fig. 5 removed from the table A^2, is a flat board having movable sides and back, within which the pile is placed. The front and rear edges of the board A^1 are beveled, as shown in Fig. 2, and are embraced by clamps, to which set-screws 3′ 3′ are applied. By loosening these set-screws, the side pieces *a a* can be adjusted transversely, and set at any desired distance apart. The side pieces *a a* are slotted longitudinally, which slots receive screws that rise through the horizontal portions of standards a^3, and receive nuts $a^\times$ on their upper ends. By loosening the nuts $a^\times$, the standards a^3 can be adjusted forward or backward. The two back standards a^2 a^2 are adjustably connected to a transverse slotted bar, a^1, which bar is itself adjustably connected to the slotted side pieces *a a* by means of screws and nuts a^5 a^5. If desirable, the standards may be connected directly to the board A, which would be slotted for the purpose. This tray, it will be seen, is adjustable for any-sized sheets of paper. It serves a double purpose, to wit: It enables the pressman to put into the feeder a large number of sheets at one time with great facility; and it also saves loss of time in adjusting a pile of paper to the center of the feeder, so as to insure a proper uniformity of margin after the sheets are printed. This nice adjustment could not well be obtained if left to the eye of the pressman; but with our movable tray the pressman can quickly and accurately adjust a pile of paper of any given size into the tray, and then by simply sliding the tray over the table A^2 until it abuts against two stops, *b b*, near the front end of the frame A, when it is known that the pile of paper is in its proper place. This desirable result is obtained by means of the adjustable standards *b b*, above described, and by having the tray fit snugly between the cheeks A A of the frame, as shown in Figs. 3 and 4. The stops *b b* rise perpendicularly from a horizontal transverse bar, b^1, which is slotted lengthwise, and through the slot pass two screws, having binding-nuts b^2 on their upper ends for fixing the stops to the said bar b^1, when they are properly adjusted.

For the purpose of picking up the sheets of paper one at a time, and delivering them between discharging devices G′ E, picking-up devices are employed, which we will now describe: B represents a hollow trunk, which extends transversely across the frame, and is supported upon springs *s s* between vertical guides J′ J′, so as to be allowed to receive a vertical bodily movement. The guides J′ J′ rise from longitudinally-reciprocating plates J, which rest on top of the cheeks A A of the frame, and are connected to these cheeks by means of pins *o* and slots *o′*. (See Fig. 1.) The plates J J receive longitudinal movements, carrying with them the trunk B, and each plate J is moved by means of the following contrivance: I represents a vibrating arm, which is pivoted at its lower end to a cheek, A, and connected to the plate J, at its upper end, by means of a pin and slot. On the shaft *e* is a segment-cam, (shown by dotted lines, Fig. 1,) which cam forces forward the upper end of arm I once during each revolution of the shaft *e*, thus moving forward the trunk. The spring s^2, which is applied to each arm I, forces back the trunk. For the purpose of giving downward movements to the trunk, a vertically-movable hooked rod, n^1, is employed on each side of the feeder, which has connected to it, by a pin and slot, a lever, n^2. The curved arm of this lever is raised once during each revolution of the shaft *e* by means of a cam, *l*, which movement brings down the trunk B. These parts are raised again by springs *s* and s^1. Near each end of the trunk B an eye, $n^\times$, is secured to it, which receives a hook, n^1, when the trunk is moved back, as shown in Fig. 1, after which the downward movement of the trunk takes place, as described. When the trunk is moved forward, the eyes $n^\times$ $n^\times$ leave their hooks.

The trunk B has four nozzles, $d^\times$, on its upper side, and two nozzles, *n n*, on its lower side, near its extremities. To the nozzles *n n* flexible hose is attached, which communicate with a suitable exhausting-engine. The nozzles $d^\times$ have flexible hose *d d′* attached to them, which are attached to nozzles on picking-up fingers, for the purpose of allowing air to be exhausted from said fingers through the trunk B. There are four fingers represented in the drawing—to wit, two longitudinal side fingers, C′ C′, for picking up the sheets along their sides, and two intermediate fingers, C C, for picking up the sheets by their front edges.

There may be any desired number of intermediate fingers used, and for this reason I do not confine myself to any definite number. Each one of the fingers is a bellows—that is to say, it is composed of two stiff boards connected together by some suitable flexible material. Each finger has perforations through its bottom, for the purpose of allowing atmospheric pressure from without to hold the sheets up to said bottom when air is exhausted from the fingers. Each finger is secured to the trunk B by means of jaws and a clamp-screw, *r′*, which jaws and screw take over ribs *r r* on the trunk. By these means the fingers can be adjusted for sheets of paper of different widths. When a sheet has been lifted from a pile of sheets and moved forward to the discharging devices G′ E, it is necessary to destroy the force of the exhaust at the moment the front

edge of the sheet is received in the bite of said devices. To this end I employ a valve, c', for an opening, c, through the trunk B. The long stem of this valve is pivoted to the trunk, and its extremity is turned up so as to be alternately struck by two fixed stops, B′ B′, rising from the cheeks A A, as shown in Fig. 1. The front stop is arranged so as to open the valve c' at the moment the paper is taken hold of by the discharge-rollers, and the rear stop is arranged to shut the valve c, when the trunk reaches the end of its back stroke, as shown in Figs. 1 and 3.

The roller E receives rotation from pulley E^2 by means of a belt which passes around this pulley, and also around a pulley, E^1, on one end of this roller, as shown in Fig. 3. The highest point of this roller E is in, or nearly in, the plane of a sheet of paper when carried up to it so that the front ends of the fingers C C′ can pass freely over said roller and between the devices G′.

If desired, a flat fixed surface may be substituted for the rolling surface E; but for many purposes I prefer the single roller, or a number of small rollers.

The top discharging devices or rolling dischargers G′ are secured to and are adjustable on a shaft, G. Each one of these dischargers G′ consists of two circular plates, having a circular piece of india-rubber, cloth, or other suitable flexible material, i, secured between them. It is desirable to have the material i directed outward, as shown in the drawings, as in this case it will not only assist the roller E in moving the sheets forward, but it will also spread the sheets smoothly laterally on the roller E. For readily and accurately applying the material i between its clamps h h', I form around the hole which is centrally through the concave clamp h a short hub, 3, corresponding exactly to the hole which is made centrally through the material i. I also form a circular central depression into the convex face of the clamp h', corresponding in diameter to the hub 3. The material is then fitted over the hub 3, and thus centered with respect to the clamp h. The two clamps h h' are then confined together by screws, and it is known that the material is in the center of them.

We find it best to have the material as thin as possible, so as to be able to run on the narrowest margin that may be required; also, to have the material i bear upon the sheets as lightly as possible, just enough to hold them upon the roller E. The sheets are thus allowed freedom to run laterally, either to the right or left, between two side guides, L^1 L^1, of a feed-board, L, and thereby facilitate the act of drawing each sheet to the required side guide.

This feature of our invention is a very important one, as the sheets are allowed perfect freedom to run onto the feed-board preparatory to being acted on by the registering devices. The feed-board L is directed downwardly from the discharge-rollers to a point which is near the impression-cylinder S, as shown in Fig. 2, Plate 2, and, by narrow continuations or guide-rests w w, the front sides of the sheets are supported while being moved from the feed-board proper to gripers on the impression-cylinder S. Our feed-board consists of transverse bars m^1 m^1 m^1, two of which are slotted longitudinally, and longitudinal corrugated or ribbed strips m m m. The strips m are secured to the two slotted bars m^1 m^1 by means of screws m^2, (shown in Fig. 2, Plate 2,) which allow the strips m to be adjusted laterally, and held at any desired distance apart. At each side of this feed-board is a guide, L^1, consisting of a bottom, a top, and a side, which latter is exactly at right angles to the longitudinal axis of the impression-cylinder S. The highest end of each guide L^1 is flaring, so as to receive under it with certainty the front edge of every sheet of paper which is discharged by the devices E G′. The side guides L^1 L^1 are adjustable laterally on the feed-board for sheets of paper of different widths; hence the necessity of making the surface of the feed-board between these guides of adjustable sections.

As the sheets leave the discharging devices they may be more or less out of a straight line, and it is therefore necessary to adjust them on the feed-board preparatory to their being taken by the gripers of the press. We accomplish this by drawing one side of each sheet against one of the side guides L^1, and almost simultaneously by drawing the front edge of the sheet to the guides of the press. For this purpose we employ revolving fingers t t^1, which are composed of narrow strips of rubber or other flexible frictional substance, secured to clamps t^2, which are adjustably applied on their respective shafts N M. The finger t is applied on a longitudinal shaft, N, whose bearings are in brackets L^2. The brackets L^2 are secured on top of each guide L^1 in such position relatively to its inner edge that the finger t, in revolving, will impinge on the margin of a sheet of paper, and move the edge of this margin up laterally against the straight longitudinal edge of the guide L. The shaft N receives its rotation from the horizontal transverse shaft M by means of bevel-wheels p p'. The feed-board is pivoted at its upper end to the cheeks A A, and supported at its lower end on frame K by means of bracket L^3 and adjusting-screws l'. The lower end of the feed-board is, by these means, adjustable vertically for setting the guide-rests w w to the face of the impression-cylinder S. The shaft M is supported, by standards, upon the frame K, and has a spur-wheel, q, keyed on one end of it, which wheel engages with the teeth of another wheel, q^1, whose shaft has its bearings in a standard, q^2. The shaft of the wheel q^1 carries a chain-wheel, v, on one end, to which motion is communicated from a chain-wheel on the shaft S′ of the impression-cylinder by means of a chain-band, 2. The two chain-wheels and the chain-band are constructed like the chain-band H and wheels H^1 H^2, so that the band cannot

slip. On the shaft M are adjustably applied two registering-flanges, t^1 t^1, which are constructed like the registering-finger t, and arranged to work over the surfaces of the guide-rests w w, for the purpose of drawing the sheets forward against the guides of the press, so as to deliver the front edge of each sheet properly to gripers on the impression-cylinder S. These fingers, and also their guide-rests w w, are laterally adjustable for sheets of different widths.

In carrying out my invention, above described, I desire to have the trunk B remain at rest for a short period of time when in a depressed position, for the purpose of insuring the proper taking hold of the sheets before the trunk rises.

For the purpose of printing both sides of a sheet we employ the two side guides L^1 L^1, one of which is used in passing the sheet over the feed-board the first time; then, after turning over the sheets, the other guide is used. A finger-carrying shaft, N, is applied in the bearings L^2 on both guides, and the bevel-wheels p' on the shaft M, which rotate the said shaft N, are adjustable, so that either one of these shafts the finger on which it is not required to use can be thrown out of gear, and its motion stopped; or, if desired, only one finger-carrying shaft, N, may be used, and this shaft changed from one pair of bearings, L^2, to the other pair, whichever guide it is desired to use.

The paper is placed in the tray A^1, which has previously had its side and back strips adjusted to the size thereof. The tray with the paper is then run into the part A of the frame upon bed A^2. The machine is then set in motion through the shaft S′, when the picking-up fingers become exhausted of atmospheric air by means of a suitable exhausting-engine, connected by suitable flexible pipes with the nozzles of the trunk B. This causes the fingers to pick up the topmost sheet of paper from the pile on the table, and to hold it until carried, by a movement imparted to the trunk by the cam e, to the roller E and dischargers i, whereupon the sheet of paper is forced down upon the feed-board L until brought under the side-registering device t, which draws it over to the side guide L^1. The sheet having been drawn to that side, the next moment it is acted upon by the front-registering devices t^1, and is then ready to be taken hold of by the gripers of the cylinder S of the printing-press, and carried properly to the printing-form. While this operation is proceeding the elevating-screws g g are turned sufficiently, by the agency of the endless chain H^1, pawl and ratchet-wheel, and worm-gearing, to cause the table-bed, with the table and paper, to rise a distance equal to the thickness of a single sheet of paper. When this is accomplished the picking-up fingers are again exhausted, and caused to pick up the next topmost sheet of the pile, and carry it forward in the same manner as the first sheet was carried, and thus the operation continues until all the paper is fed out of the machine.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. Picking-up fingers adjustably applied to and combined with a movable trunk, B, substantially as described.

2. Picking-up fingers C′ C′, arranged longitudinally with respect to the sides of the feeder for picking up the sides of the sheets, substantially as described.

3. The combination of one or more forward-projecting fingers, C C, for picking up the front edges of the sheets, with the longitudinal fingers C′ C′, for picking up the sides of the sheets, substantially as described.

4. The guides J′ J′ on longitudinally-movable trunk-carriers J J, combined with arms I and cams on the shaft e for vibrating these arms, and with springs s s^2, substantially as described.

5. The depressing-hooks n^1, eyes $n^\times$, levers n^2, springs s^1, and cams l, combined with the vertically-movable trunk B, for depressing this trunk and its picking-up devices at the termination of the back strokes of the same, substantially as described.

6. The feed-board L, composed of laterally-adjustable sections m, substantially as described.

7. The adjustable feed-board side guides L^1, substantially as described.

8. The longitudinally-rotating and laterally-adjustable registering-fingers t^1 t^1, working over the adjustable guide-rests w w, leading from the feed-board to the impression-cylinder S, substantially as and for the purpose described.

9. The extended bracket-nuts g^1, attached to the sides of the adjusting table-bed A^2, which moves up and down within the part A of the frame, in combination with the elevating-screws g g, worms g^3, worm-wheels g^2, and a ratchet and pawl, all arranged outside of the frame of the machine, substantially as and for the purpose herein described.

10. The paper-tray A^1, having side and back pieces a a^1, which are adjustable, applied upon a table-bed, and made removable from said bed at pleasure, substantially as and for the purpose described.

11. Flexible pipes d' d', combined with laterally-adjustable picking-up fingers on a trunk, B, substantially as described.

12. A circular flexible discharging device confined between concave clamps, for the purpose set forth.

13. The laterally-adjustable and laterally-rotating flexible finger t, combined with the side guide L^1 and feed-board, substantially as described.

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JAMES MARTIN, Jr.