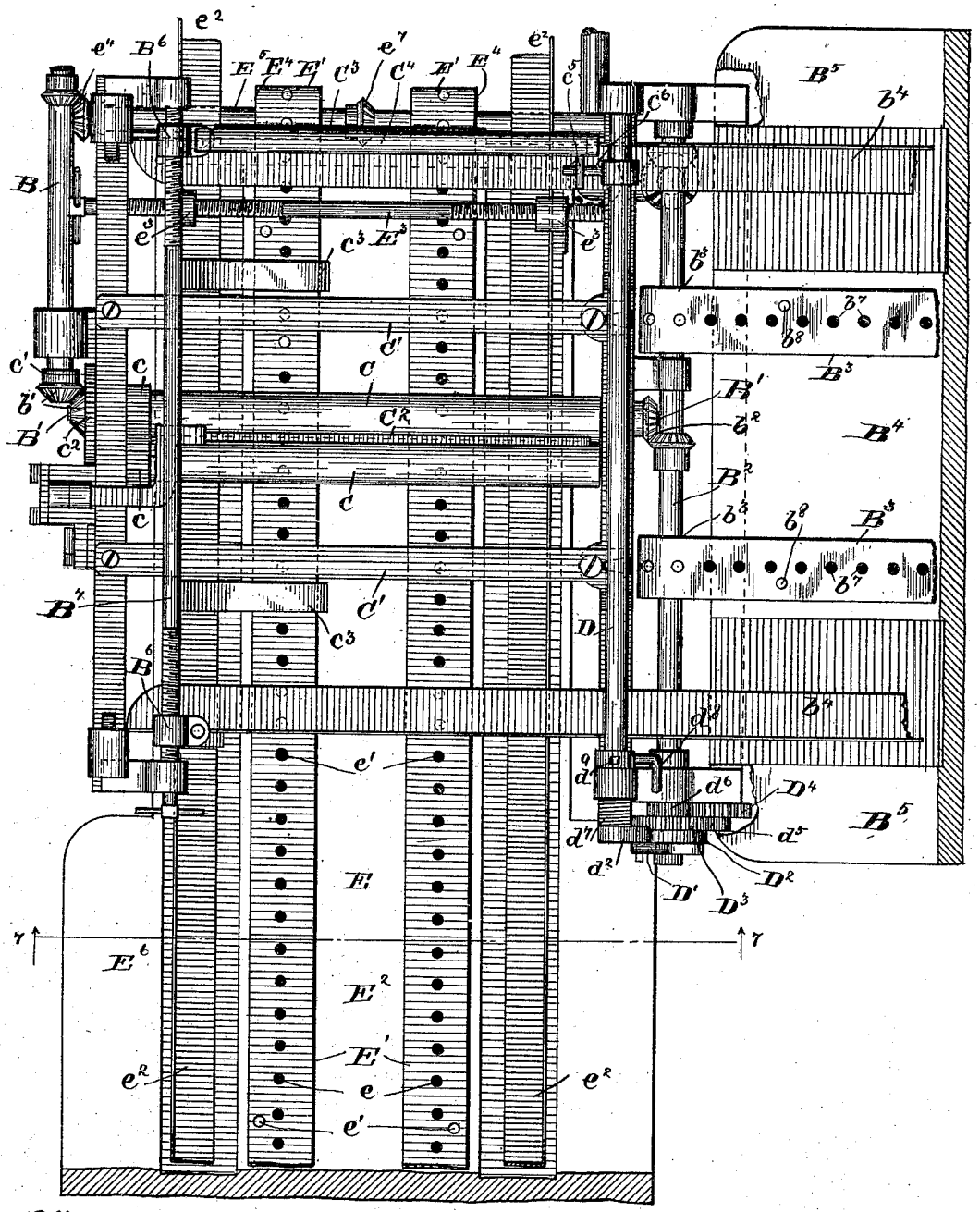
(No Model.) 11 Sheets—Sheet 1.

J. R. McDONALD.

MACHINE FOR FOLDING CIRCULARS.

No. 513,435. Patented Jan. 23, 1894.

Fig. 1.



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(No Model.) 11 Sheets—Sheet 2.

J. R. McDONALD.

MACHINE FOR FOLDING CIRCULARS.

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Fig. 2.

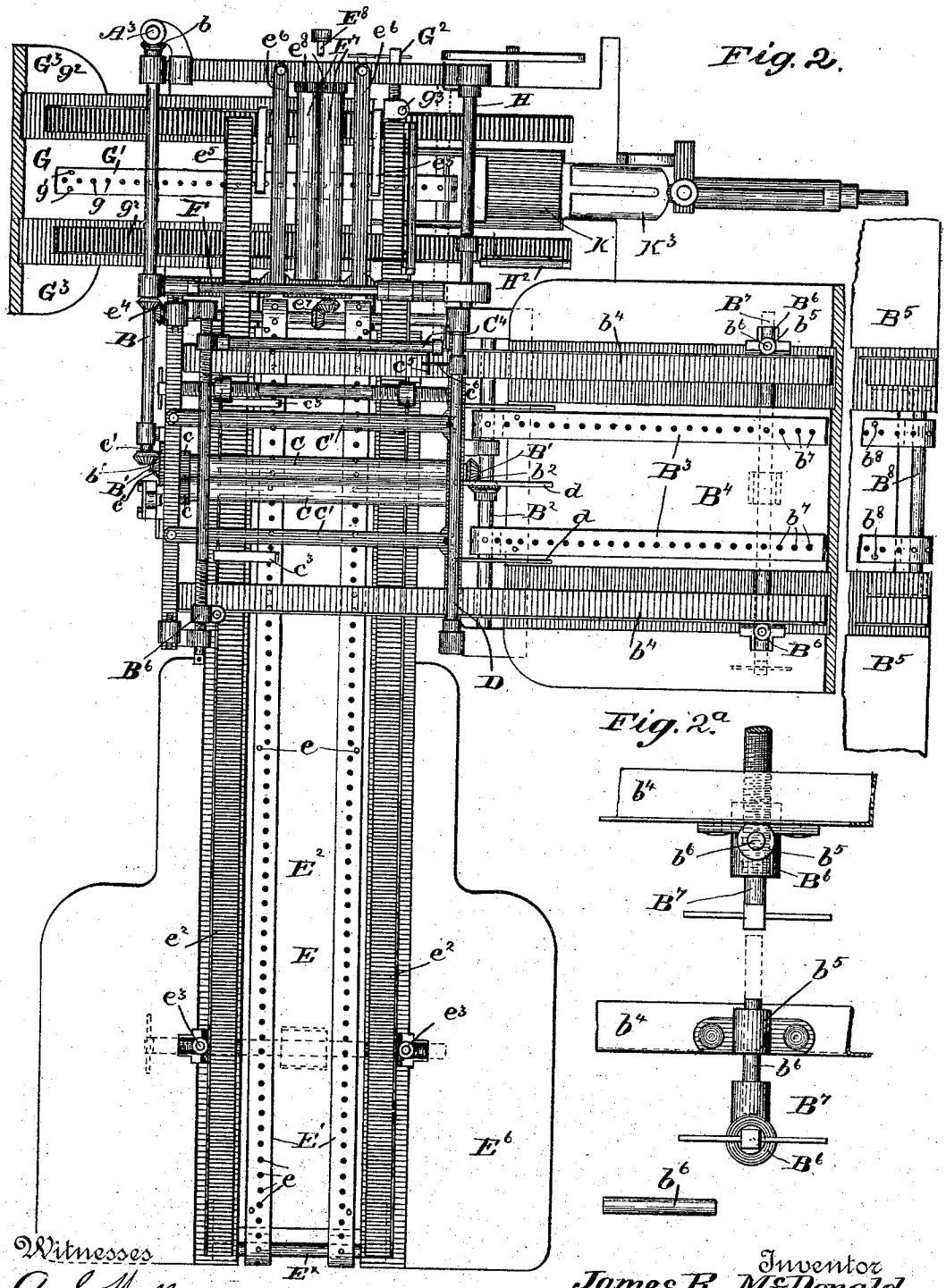

Fig. 2a.

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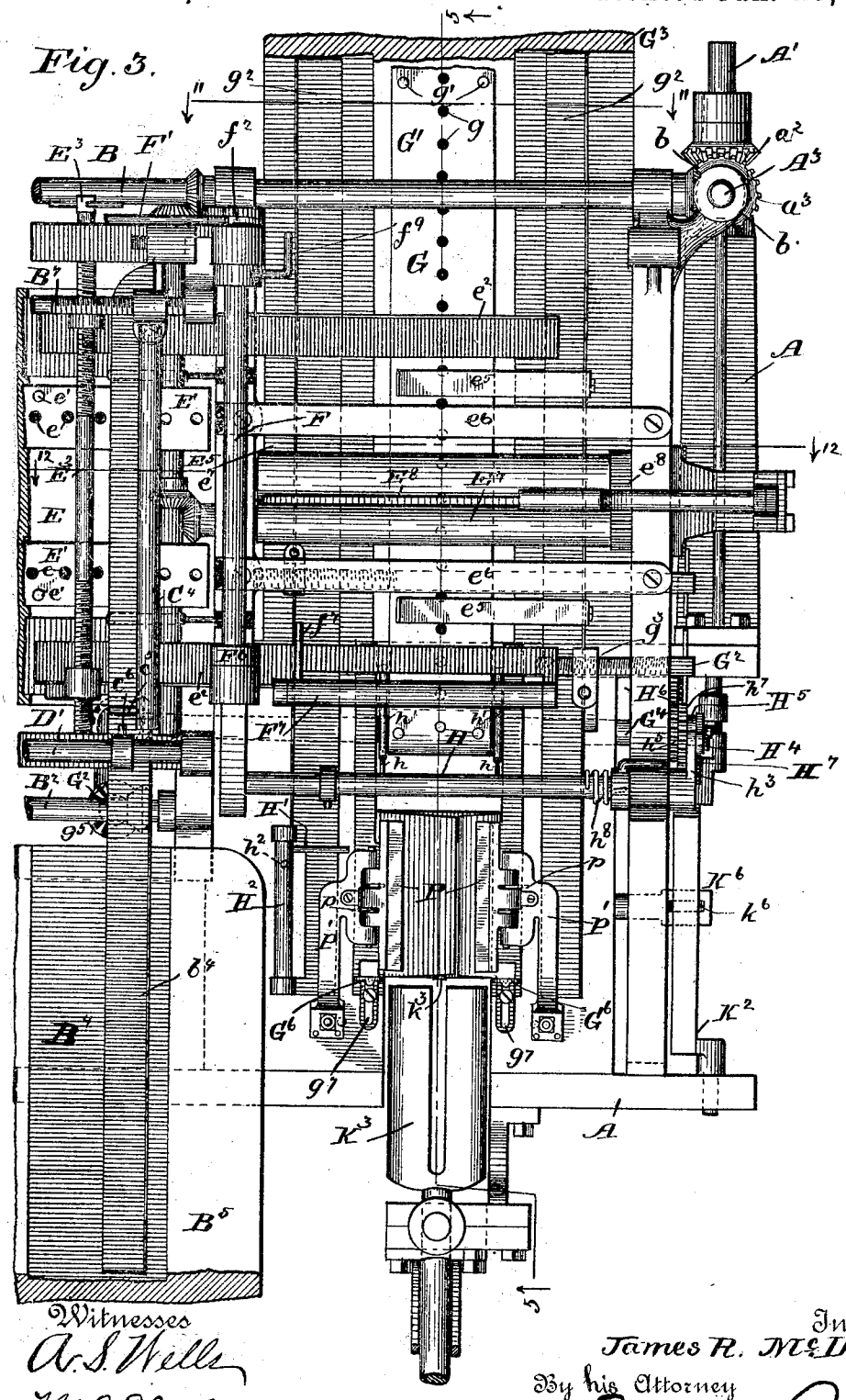
J. R. McDONALD.

MACHINE FOR FOLDING CIRCULARS.

No. 513,435. Patented Jan. 23, 1894.

Fig. 3.



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MACHINE FOR FOLDING CIRCULARS.

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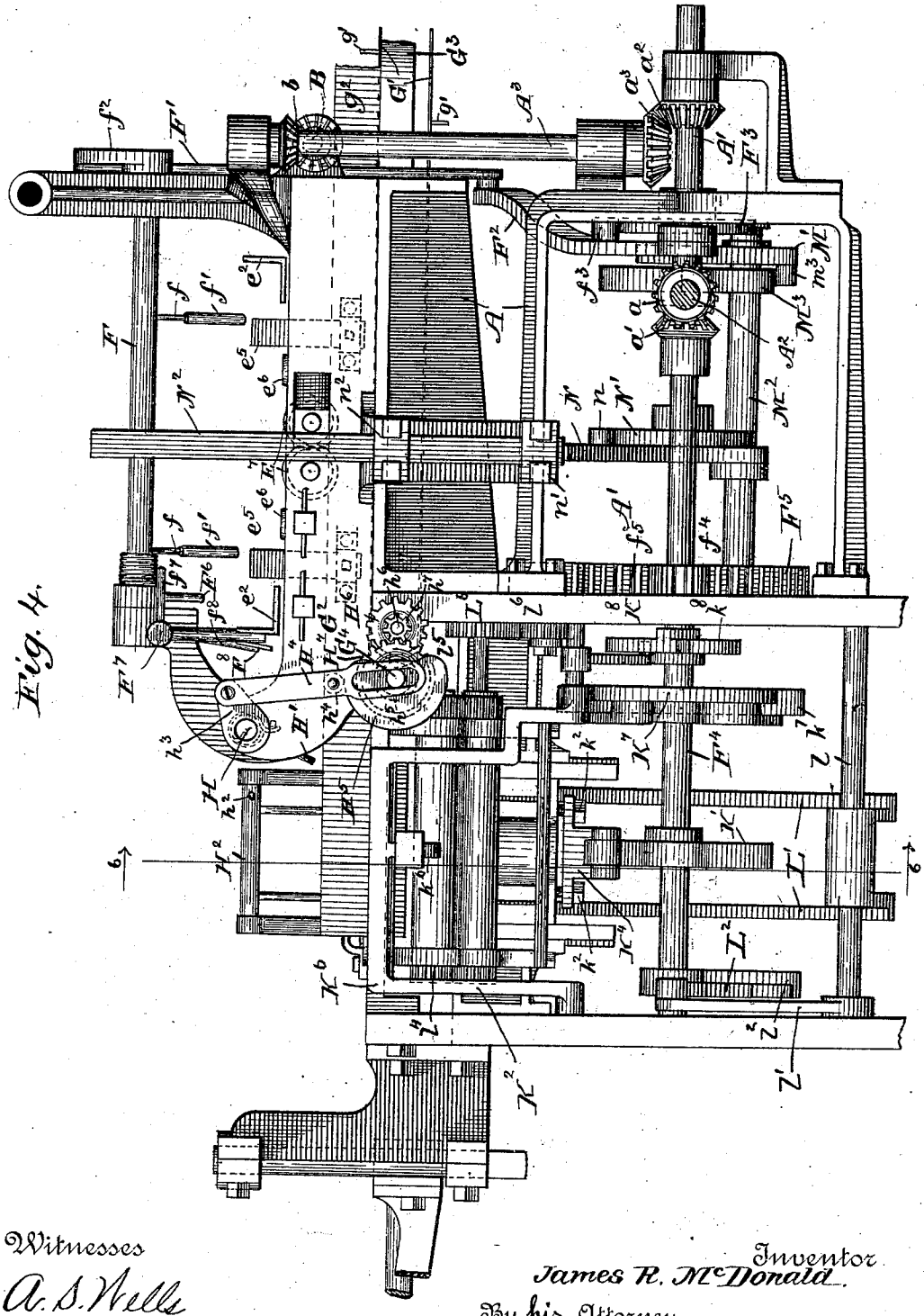

Fig. 4.

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MACHINE FOR FOLDING CIRCULARS.

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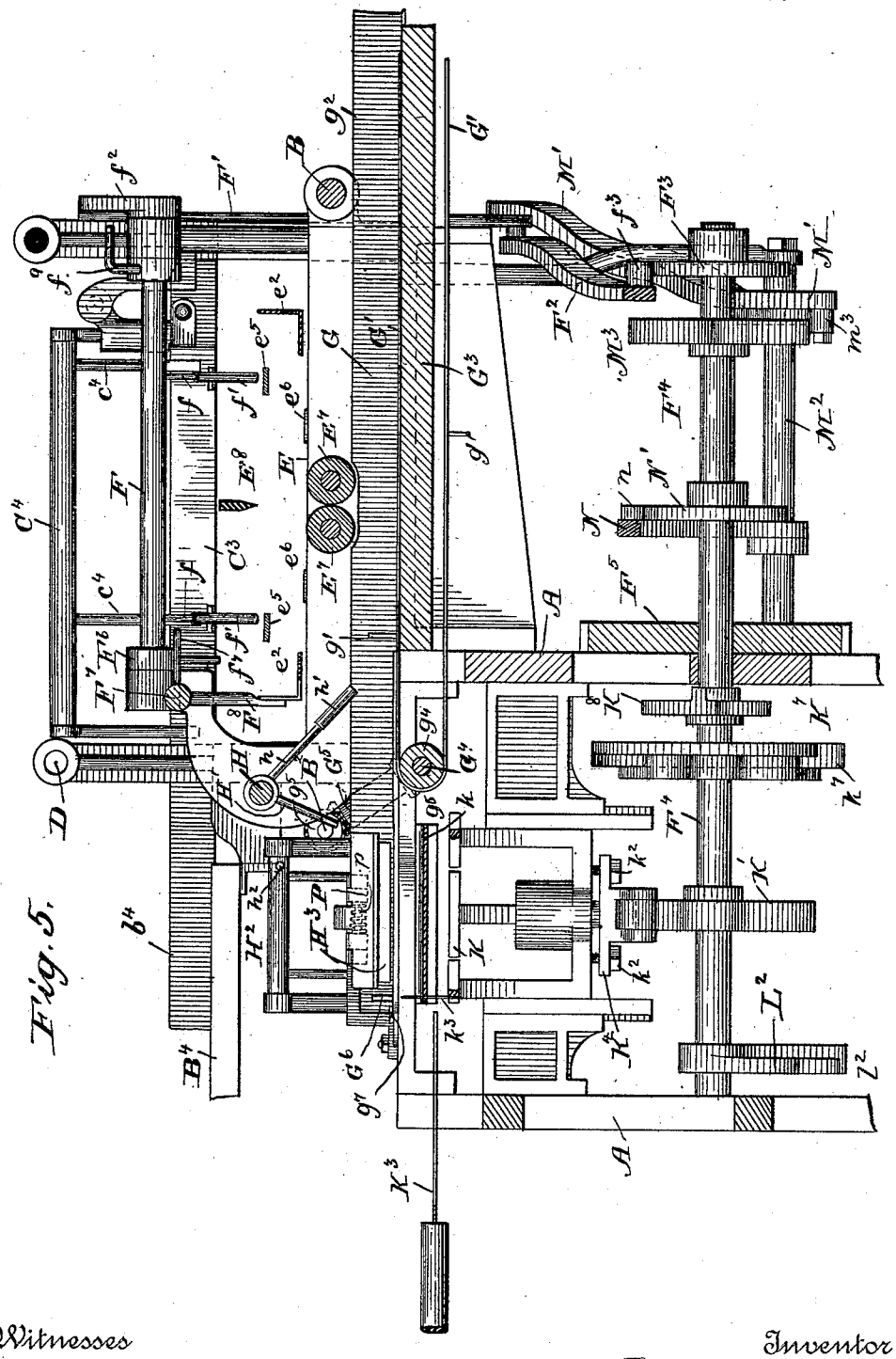

Fig. 5.

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MACHINE FOR FOLDING CIRCULARS.

No. 513,435. Patented Jan. 23, 1894.

Fig. 6.

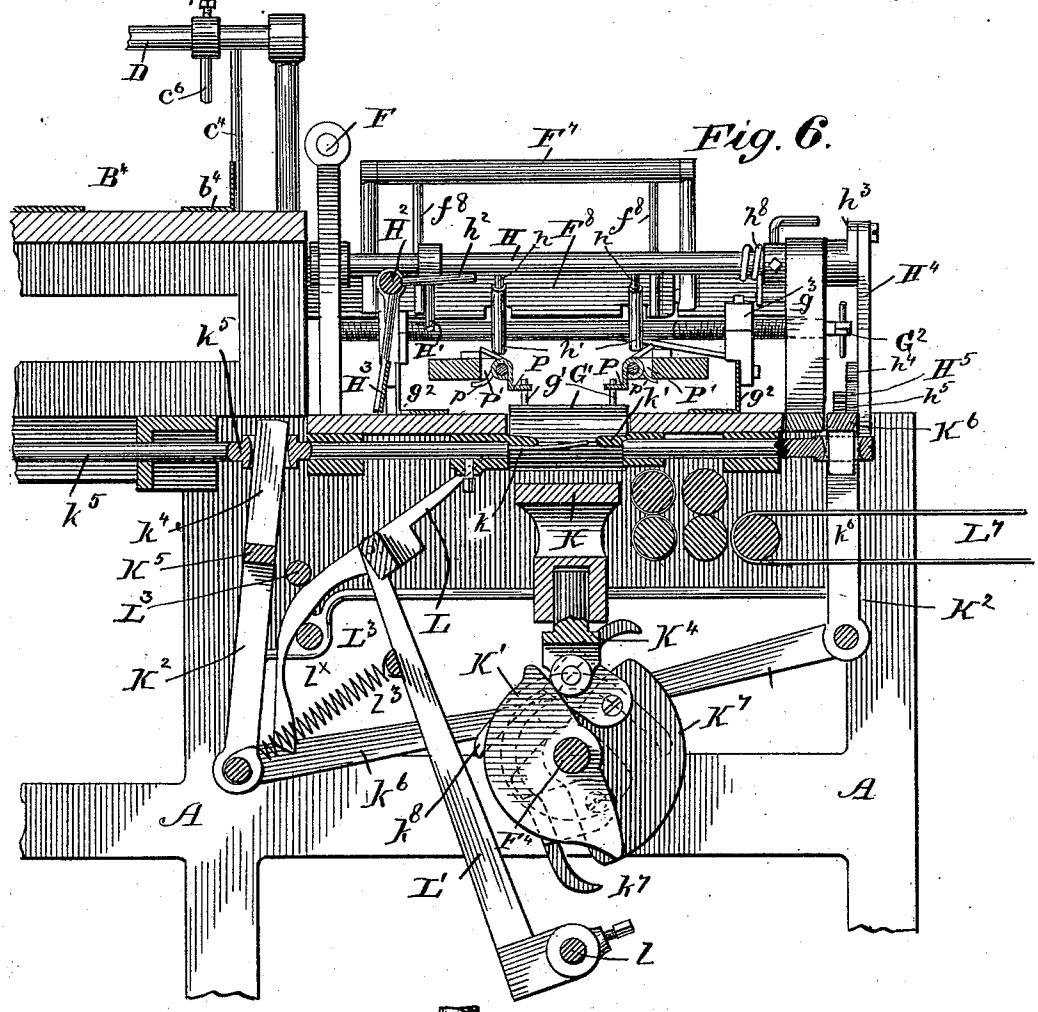

Fig. 6a.

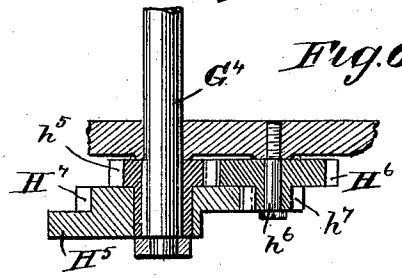

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Fig. 7.

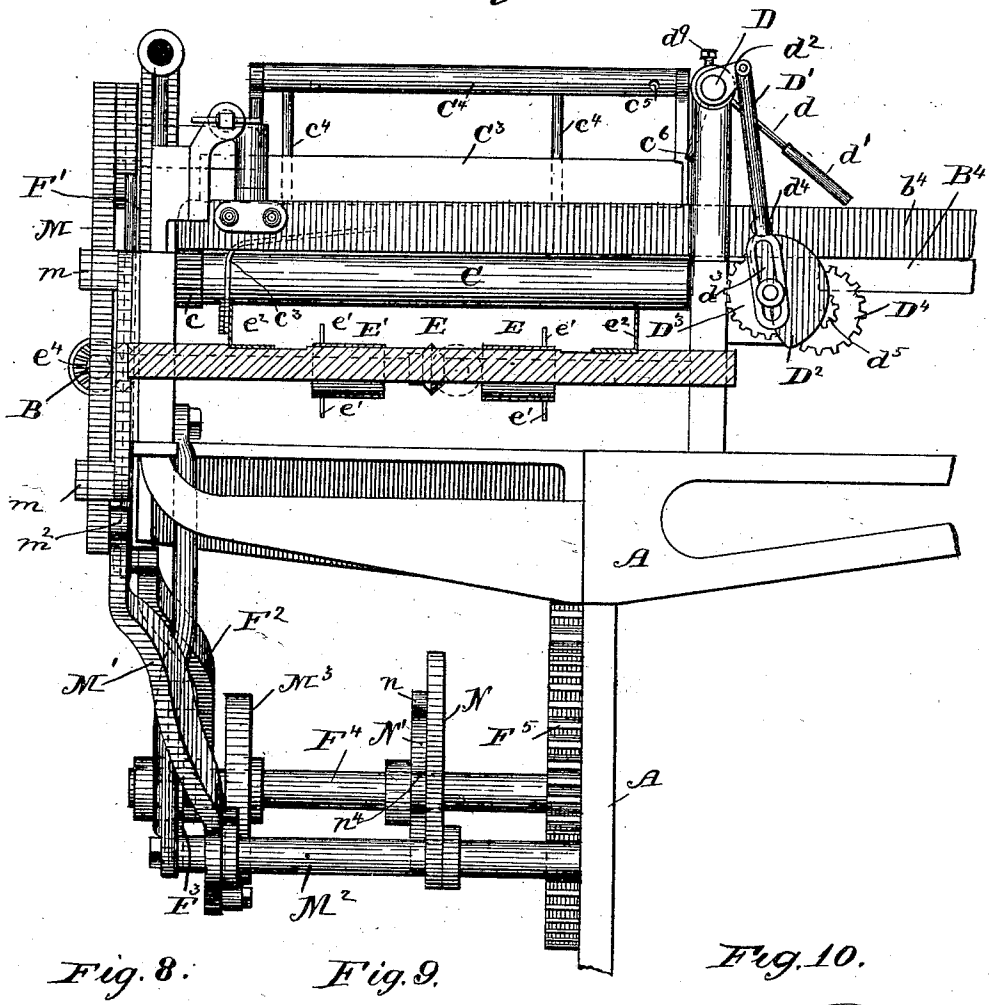


Fig. 8.

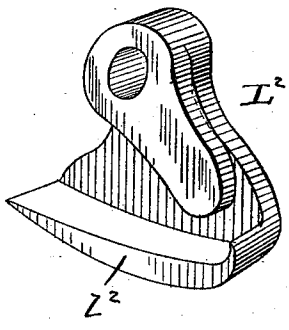


Fig. 9.

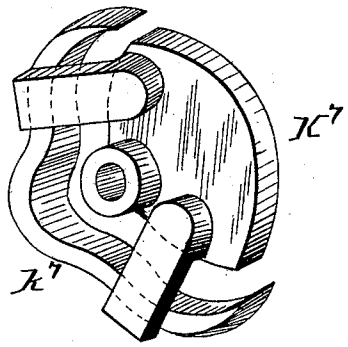
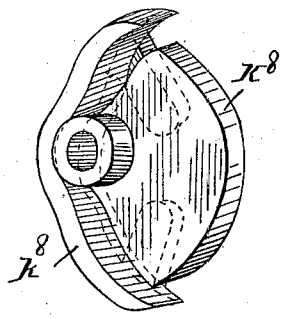


Fig. 10.



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MACHINE FOR FOLDING CIRCULARS.

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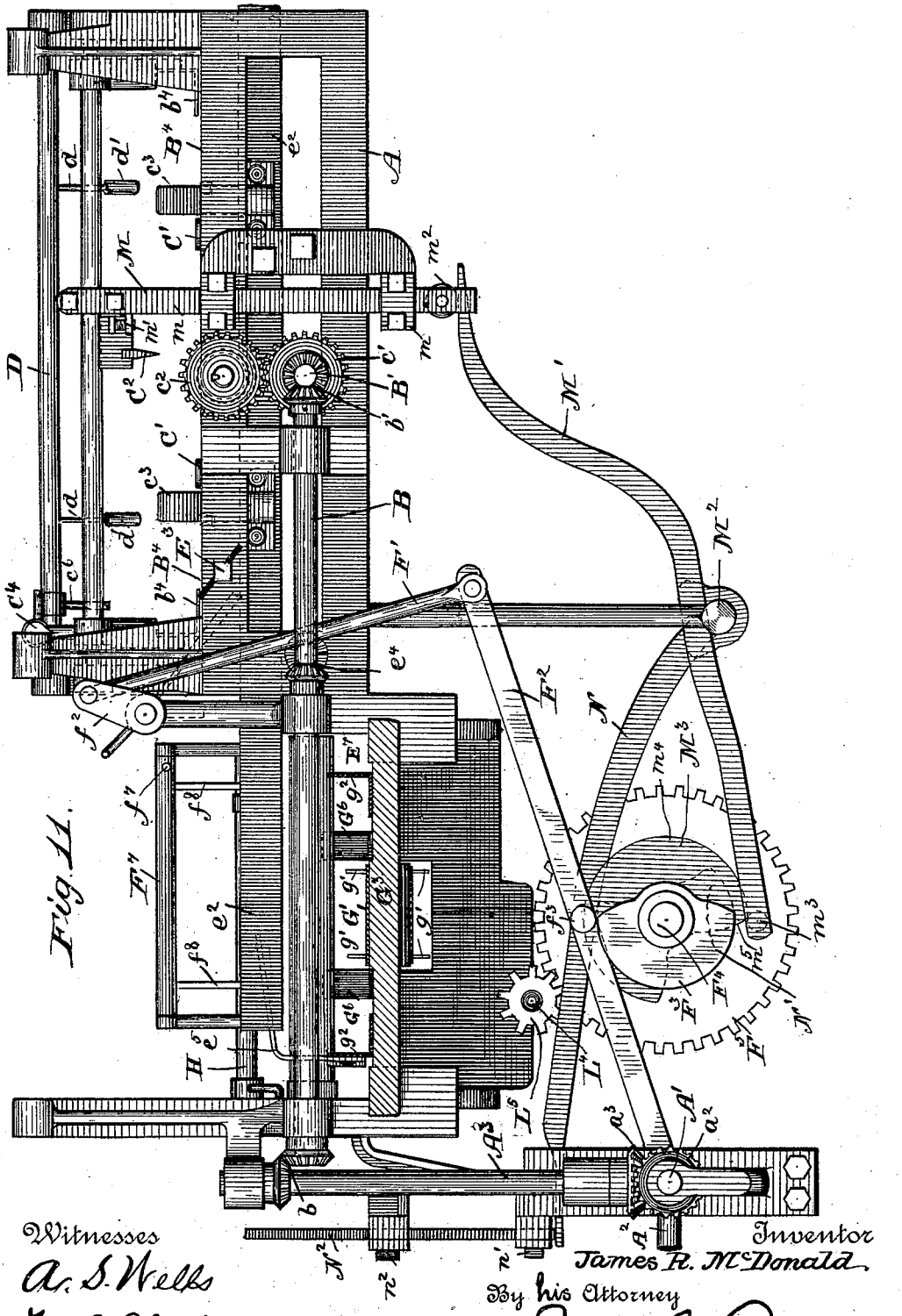

Fig. 11.

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MACHINE FOR FOLDING CIRCULARS.

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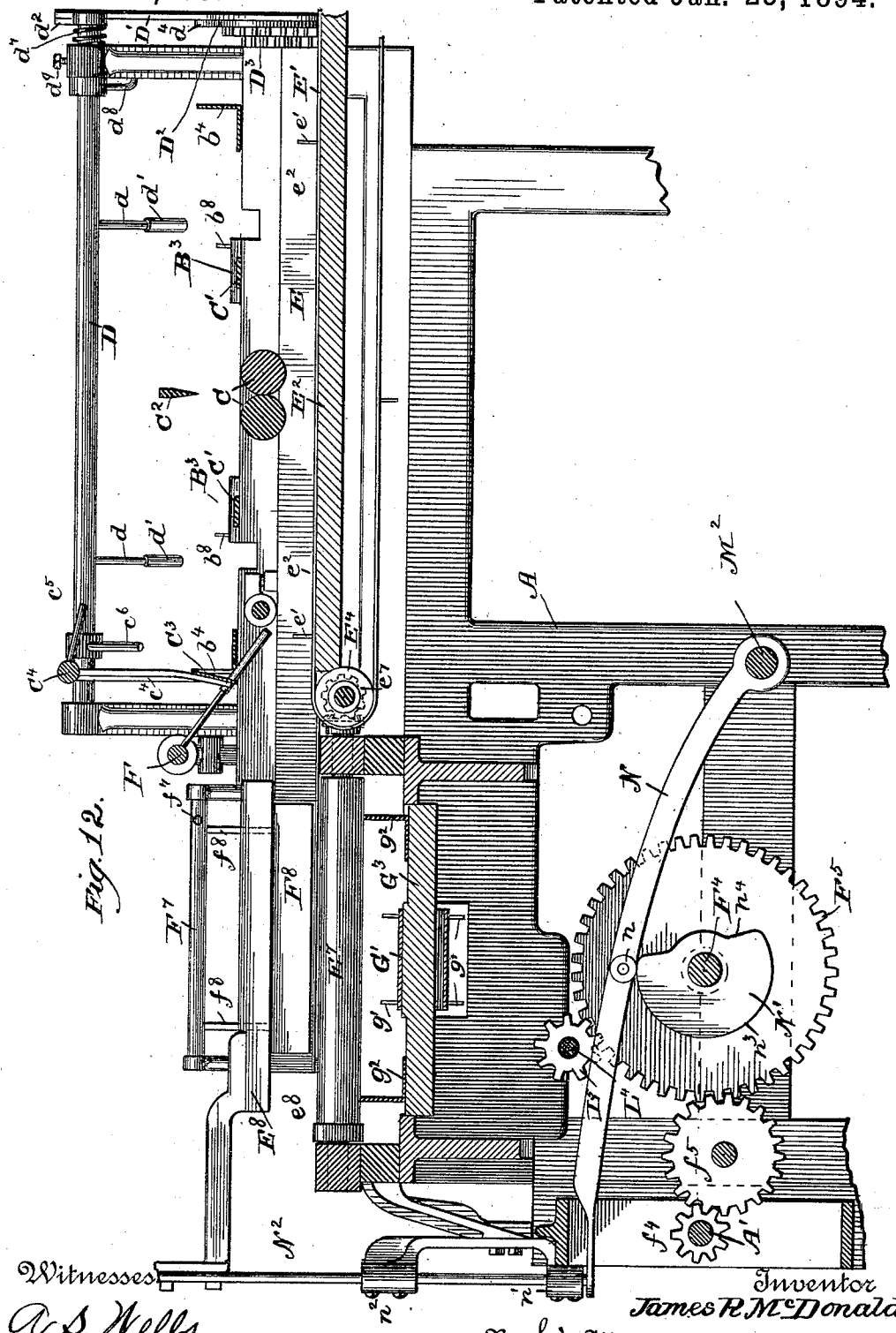

Fig. 12.

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MACHINE FOR FOLDING CIRCULARS.

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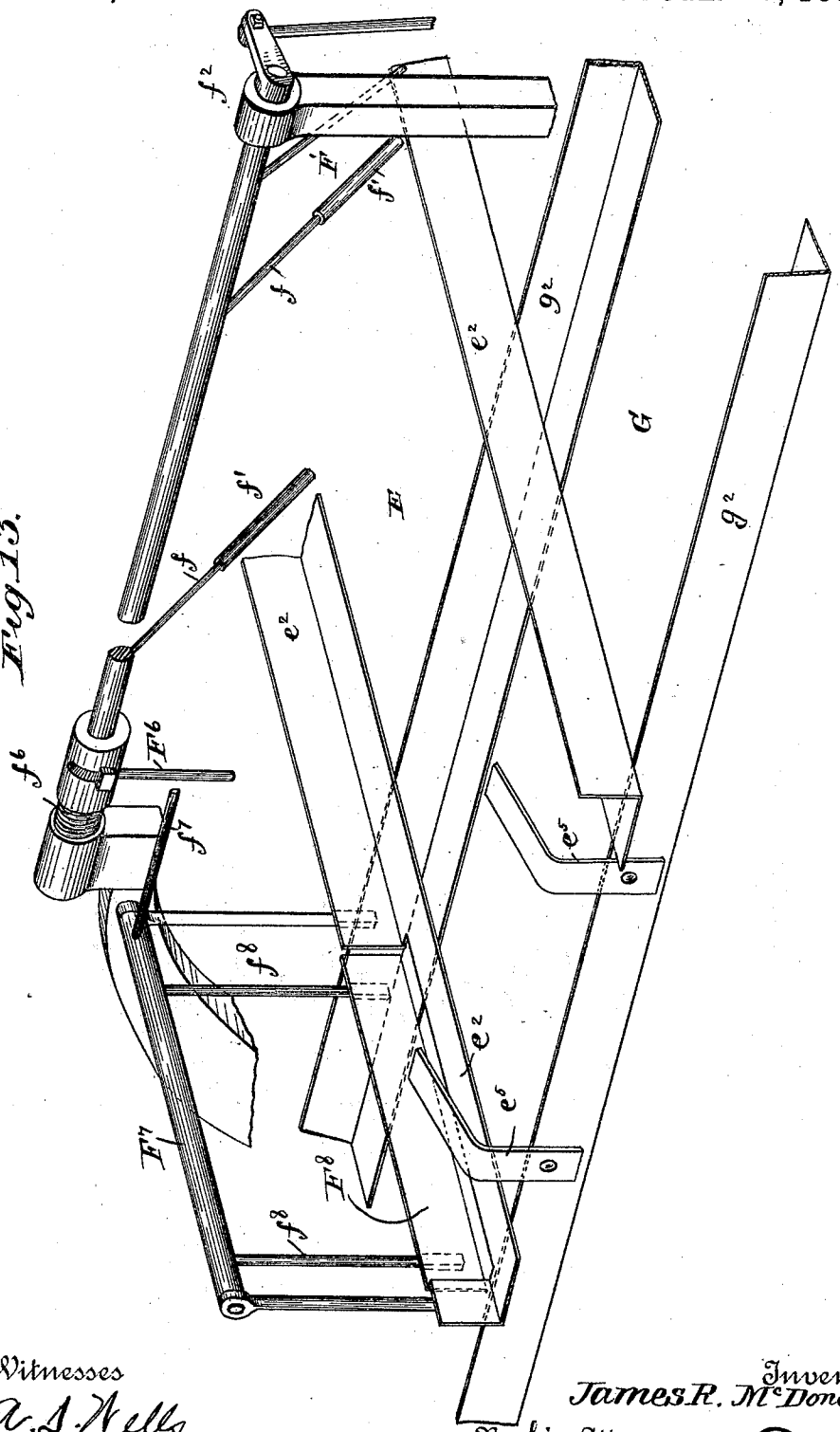

Fig. 13.

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MACHINE FOR FOLDING CIRCULARS.

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Fig. 14.

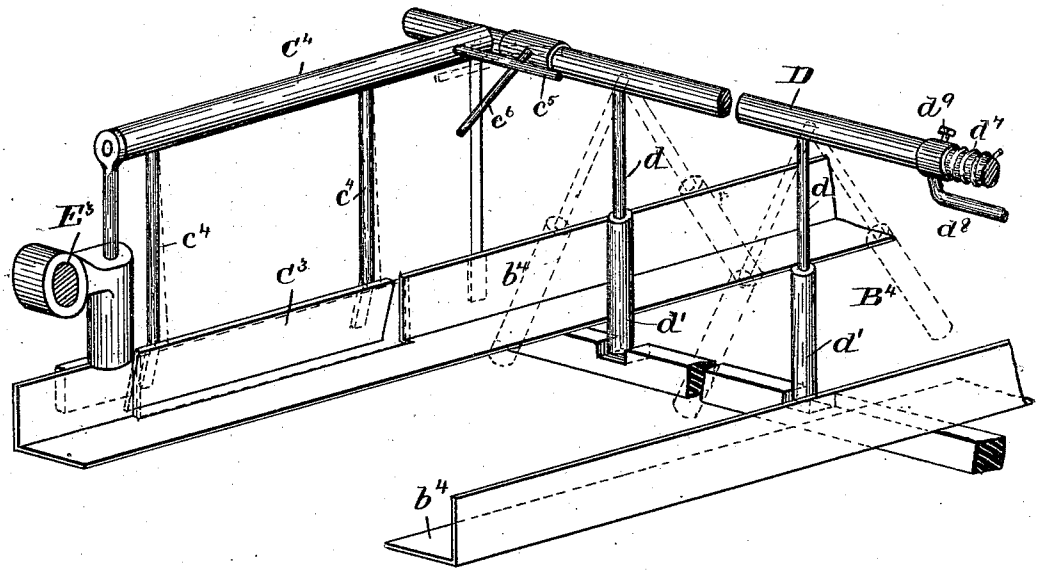


Fig. 15.

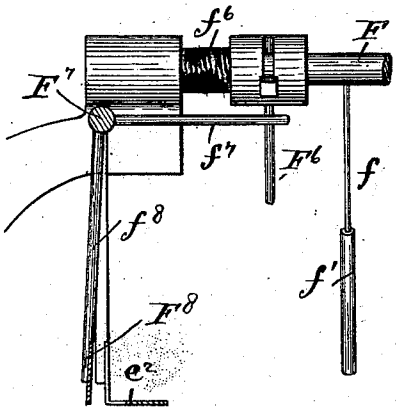


Fig. 16.

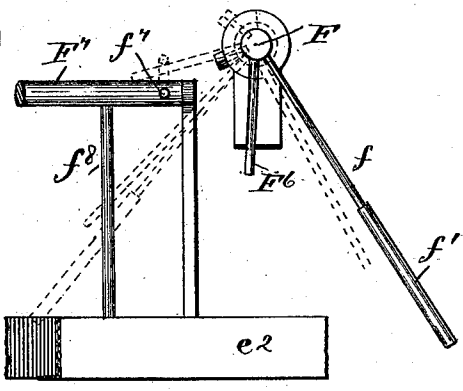
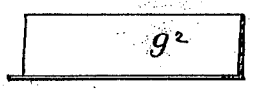


Fig. 15a.



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UNITED STATES PATENT OFFICE.

JAMES R. McDONALD, OF CHICAGO, ILLINOIS.

MACHINE FOR FOLDING CIRCULARS.

SPECIFICATION forming part of Letters Patent No. 513,435, dated January 23, 1894.

Application filed December 22, 1891. Serial No. 415,847. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. McDONALD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Folding Circulars, of which the following is a specification.

My invention has for its object to fold circulars from flat or partly folded sheets and incidentally to deliver them to other mechanism to be conveyed to a partly formed envelope in which they may be inclosed and prepared for the mail by machinery.

A further object is to fold and nest or assemble two or more circulars of the same or different size so that they may all be inclosed in a single package and enveloped together without the employment of attendants other than those that look after and feed the machine itself.

The invention may be stated to consist, in general terms, of a broad feed channel having conveying belts moving in one direction, to receive circulars or printed material of the broadest size desired to be folded; folding devices at the terminus of this channel; a transverse channel beneath said folding devices receiving the folded material therefrom and itself adapted to receive a circular or printed material of appropriate similar size at or near its initial end; folding mechanism at the terminus of this channel and its feeding devices, adapted to fold the whole burden from the two preceding channels, nested as it will be, and if necessary successive transverse channels, one or more, succeeding the latter folding channel according to the number of circulars or printed letters to be folded and enveloped, the whole finally discharging either into a receptacle, or preferably into conveying mechanism which carries the folded material to the envelope-box.

In the drawings: Figure 1 is an enlarged view, or top plan view of the first feed channel, with conveying belts, folding devices, adjusting devices to determine the width of the channel, and a secondary feed channel and its conveying devices and adjusting devices, all being partly broken away. Fig. 2 is a top-plan view of a portion of the folding and assembling device constructed according to my invention, showing first, at the right hand side of the figure, a channel and feed-belts for a wide sheet; second, toward the foot of the figure, or foot of the sheet, a channel and conveyer for narrower sheets, receiving from the folding and squeezing rolls of the first conveyer; third, at the upper left hand side of the figure, a channel and conveyer for still narrower sheets, receiving from the folding and squeezing rolls of the second conveyer, which may or may not act upon material from the first conveyer, depending on whether such material is fed; and finally toward the right hand lower end a device which has been termed a paddle-fold, intended to complete the folding of the entire mass of nested circulars for the purpose of sending them to the enveloping machine. Fig. 2ª, is an enlarged detail of the adjusting devices in the above mentioned figure. Fig. 3 is an enlarged view of that part of the machine nearest the paddle-fold including the latter and showing also parts of all the before mentioned feed-channels and conveyers, all in top-plan view. Fig. 4 is an elevation seen from the delivery side, or that side on which the folded material is transmitted to the enveloping machine. Fig. 5 is a vertical cross-section on the correspondingly numbered line in the third figure; Fig. 6, also a vertical cross-section on the correspondingly numbered line in the fourth figure; and Fig. 6ª, an enlarged detail of the train for operating the rake in the last feed channel; Fig. 7, a vertical cross-section on the line 7—7, Fig. 1, looking from the feed end or that end farthest from the point where the folded material is discharged; Fig. 8, an enlarged detail of the cam for operating the ejector knife or blade which carries the folded material to the squeezing rolls after the action of the paddle, as shown in the sixth figure of the drawings, to cause it to be delivered to the conveying devices for the envelope machine; Fig. 9, an enlarged detail of the cam which operates the folding knife in the last feed channel; Fig. 10, an enlarged detail of the cam which operates the knife or knives that fold the flaps over the paddle in the final folding operation; Fig. 11, a vertical section on the correspondingly numbered line in Fig. 3 seen from the side; Fig. 12, a

similar vertical transverse section seen from the same side as the last, but on a different line, as indicated by corresponding numerals in said third figure; Fig. 13, an enlarged detail of one of the feed channels, showing also the evening up devices for brushing the folded material against stops placed transversely of said channel, so that it may be registered in proper position for the descent of the knife or paddle; Fig. 14, a diagrammatic view of the feed-channel with the raking or evening up devices for the purpose just stated; Fig. 15, also an enlarged view of said yielding raking devices; Fig. 15ª, a section of the folding or of a second feed channel beneath said devices; and, finally Fig. 16 a further view in vertical section, transversely to the foregoing, to more completely illustrate the operation of the devices.

A represents the frame of the machine which will advisably be of metal firmly bolted together and of such outline in top plan as to accommodate the number of conveyers and their immediate folding devices which may be deemed necessary, as, for instance, in Fig. 2, where three conveyers and three sets of folding devices are shown, each successive conveyer with its folding mechanism being adapted to narrower widths of material than the preceding.

Mounted in the main frame, adjacent to the delivery end of the machine is the main driving shaft, A′, and as it is the primary intention to employ the folding and assembling devices herein described in connection with a machine for forming envelopes and inclosing the folded material therein, such, for instance, as shown and described in application of McDonald and Stebbins, filed August 2, 1889, Serial No. 319,499, patented December 15, 1891, No. 464,984, a motor-shaft, A^2, is shown in cross-section, corresponding to the transmission-shaft shown in said application, for communicating motion from the enveloping machine to the folding devices and properly timing the two, such motor-shaft engaging with the main-shaft of the folding and assembling machine by means of bevel gears, a, a', at one end, for instance, the right hand end as seen in Fig. 4. The main-shaft drives, through intermeshing bevel gears, a^2, a^3, an upright shaft, A^3, which at its top engages with and drives by bevel gears, b, a short horizontal shaft, B, running along the outer end of the machine, the latter in its turn engaging by bevel gears, b', the lateral-shaft, B′, extending transversely beneath the flooring of the adjacent part of the machine, and at its farther end connected by bevel gears, b^2, with a shaft, B^2, which carries the actuating drums or sprocket-wheels b^3, for the conveyer belts, B^3, of the larger feed-channel, B^4. This feed channel is sunken somewhat below the surface of an attendant's table or platform, B^5, extending for a distance along its length, and is intended to have adjustable sides or guards, b^4, of angle-iron so as to adapt it to the width of the circulars or other printed matter fed to it from the table. For the purpose of adjusting these guards properly and co-ordinately without loss of time, while leaving them free to be detached at any time, I prefer to form them with vertical side sleeves or sockets, b^5, two or more to each guard, each receiving an upstanding pin or bolt, b^6, from a socket in a threaded nut, B^6, the nuts for the two guards being in pairs, and each member of a pair being directly opposite the other, at either side of the channel, but being reversely threaded, and into these nuts I insert a two way hand-screw, B^7, running beneath the flooring of the channel and having one thread adapted to engage with one of the nuts and the other thread to engage with the opposite nut so that whenever the screw is turned the movable side walls or guards of the feed-channel may be brought near together or set farther apart, and whenever it is desired to lift them off of the machine they can easily be slipped over the ends of the pins. At the end of each feed-channel, however, the hand screw may bridge the guards, instead of being beneath where it might interfere with active apparatus of the machine.

Instead of employing tapes to convey the folded material, or material to be folded, I prefer to make the conveyer belts of leather or equivalent strong material and in order that they may not slip relatively to each other and so take the folded material, or the material to be folded, forward to the next operation in a position askew of the channel, and that they may be positively timed with reference to the action of the preceding or succeeding conveyers or folders, form them with a series of perforations, b^7, into which enter sprocket teeth for the driving drums. At regular intervals, teeth, b^8, will be fixed in the belts, abreast of each other, the intervals being proportionate to the timing of the folding devices so that material shall be carried forward and delivered accurately and regularly for the succeeding operations. An idle shaft at the outer end of the feed platform will of course be provided carrying drums or sprocket-wheels, B^8, corresponding to those on the inner or driven shaft so that the belts shall be properly straightened and guided. This table with its conveying mechanism just described is or may be considered to be the largest in the machine and it feeds the large unfolded circulars delivered to it from the feed platform, by the attendant or attendants, from the right toward the left, as shown in the first figure of the drawings, these terms of position, however, being merely conventional or relative and adopted for the purpose of this description. At the left hand this primary conveyer delivers the unfolded material over folding and squeezing rolls, C, which intermesh with each other by means of spur-gears, c, and are driven from the underlying counter-shaft which drives the primary conveyer, through the agency of the spur

gear, c', on said shaft and spur-gear, c^2, on the gudgeon of one these rolls. Parallel with these folding-rolls and at about the same horizontal plane are flooring-strips, C′, which are or may be practically in line with the feed-belts and serve, together with the angular side-guards, which also are extended past the folding-rolls, as extensions of the conveyer to support the sheet until the knife, C^2, comes down and carries it into the grasp of the rolls. Near the outer or extreme end of these folding-rolls are gage stops, c^3, against which the sheet is carried by the action of the teeth on the belts, and which, together with the side-guards insure its being in proper position for the action of the knife and of the folding-rolls, these stops being adjustable, as will presently appear.

The end of one of the side-guards of the primary feed-channel is cut away opposite the folding-rolls, as represented in Figs. 7 and 12, and playing in the cut away space is a butter-board or bar, C^3, constituting a section of said guard supported by depending fingers, c^4, from an overhead rock-shaft, C^4, an arm, c^5, from which is struck by a radial adjustable arm or tappet, c^6, upon the rake-head of the primary feed-channel whenever the latter is actuated to carry the sheet or circular over the folding rolls; thus, as the sheet strikes the stops, the butter-board will move up on one side and press it against the guard on the opposite side of the channel, straightening it out and insuring that it shall be in proper position for folding evenly. At the end of this first set of conveying-belts or feed-belts,—which preferably do not extend quite to the inner end of the folding-rolls to which they deliver,—is mounted an oscillating rake-head, D, supported in standards rising above the feed-channel and arranged transversely to and bridging said channel. From this rake-head depend teeth, d, which as to their ends are advisably made flexible: that is, they may have a lower section, d', of flexible india-rubber or other material, either solid or in the shape of a tube partly slipped over the metal teeth so that the tips yield to any slight resistance, and will not crumple the sheet of paper. This rake-head has a crank-arm d^2, at one end, from which depends a link, D′, slotted at its lower end as at d^3, to take over the outer end of the shaft which drives the primary set of conveyer-belts, and having an anti-friction roll, d^4, which travels upon the periphery of a cam, D^2, loosely mounted on said shaft. This cam has secured to it a gear-wheel, D^3, driven by a pinion, d^5, fast to an idle-gear, D^4, which in turn is driven by a pinion, d^6, fixed to said driving-shaft for the conveyer-belts, the timing being such that the raised periphery of the cam holds the rake-teeth up: as shown, for instance, in Fig. 7, until the teeth on the conveyer-belts have delivered a sheet over the folding-rolls, when the anti-friction roll on the slotted link comes upon the falling away part of said cam, and a coiled spring, d^7, upon the rake-head carries the teeth down to push the sheet home against the gage stops. The distance through which the teeth travel or are carried by the action of the coiled spring may be determined by a bent stop-arm, d^8, sleeved upon the rake-head and clamped thereupon by a set-screw, d^9, at any desired radial adjustment and striking the adjacent bearing bracket, as shown, for instance, in Fig. 1, such adjustment being sometimes desirable to correspond with the size of the sheet being fed, or with the size of the subsequent sheets with which it is to be nested and with the position of the gage stops, as will presently appear.

Beneath the primary set of folding-rolls, and at right angles to the primary feed-channel, is a second feed-channel, E, provided with belts, E′, having perforations, e, and teeth, e', flooring, E^2, and angular side-guards, e^2, mounted in sleeved sockets, e^3, and adjustable by right and left screw-rods, E^3, and thus far like the first the construction being,—for the purpose of this description,—practically identical with the primary channel. The second feed-channel, however, is intended to be narrower than the first; that is, unless there should be reasons for making it of the same width, the folded material fed to it from the first through the folding-rolls will practically fit therein between the side-guards. Its belts are driven by means of toothed drums or sprocket wheels, E^4, on a shaft, E^5, meshing by bevel-gears, e^4, with the lateral shaft, B, and consequently being parallel with the transmission shaft by which motion is imparted to the drum-shaft of the primary set of feed-belts or conveyers, and they at the other end of the driving-drums are led over similar drums on an idle-shaft, $E^\times$, and tautened thereby. The timing will be such that a set of teeth on these belts of the secondary feed-channel will present a sheet beneath the folding rolls of the first channel at the moment said rolls are delivering folded material therefrom, so that such material will be deposited or nested upon that in the second, to be folded therewith and therein in the ensuing operations of the machine.

Alongside the secondary channel there is a feed-table, E^6, like that alongside the first, and from this table attendants will feed sheets suitable to the size of the channel as obtained by the adjustment of its side guards, which sheets as just explained, will be brought beneath the primary folding rolls as they are depositing the material from the first channel.

Upon the outer guard of the secondary channel, that is upon the guard which marks the delivery end of the primary feed-channel, are secured the before mentioned gage-stops for the latter. Consequently whenever the width of the second channel is altered these stops are adjusted in or out, as the case may be, to check the material delivered over the folding rolls of the first at the proper point to enter between the guards of the second.

The secondary channel terminates with gage-stops, e^5, flooring-strips, e^6, a pair of folding rolls, E^7, and extended side-guards like the first, said folding-rolls being driven by bevel-gears, e^7, from the drum-shaft of the conveyer-belts and by intermeshing pinions, e^8, at their ends, and having the nested material entered between them by a knife, E^8, and beneath this second pair of folding-rolls and at right angles thereto, or parallel with the first, is or may be, a third feed-channel still narrower, constructed with adjustable side-guards, adjusting devices and feed belt or belts like the other two, and intended to receive from its feed-tables, circulars or printed material of a suitable size to correspond with the previously nested material from the first two feed-channels which is delivered upon the material fed to the third by the folding rolls, as presently described.

The gage-stops for the secondary feed-channel are secured to the outer adjustable side-guard of the third feed-channel, so that whenever the width of this is increased or diminished the position of the stop-fingers shall be suitably altered, that the folded material coming from above may fill properly into the channel.

Above the delivery end of the conveyer-belts of the second channel is an oscillating rake-head, F, similar to that above the delivery end of the primary channel, having like depending fingers, f, preferable with flexible ends, f', and actuated in any suitable manner; for instance, by a crank-arm, f^2, at its end connected by link, F', with a lever, F^2, which is pivoted at the other end to the framework and has an intermediate anti-friction roll, f^3, traveling upon a cam, F^3, on a cam shaft, F^4, corresponding to the cam-shaft in the hereinbefore mentioned Letters Patent to Stebbins and McDonald for folding machine, and driven from the main-shaft through pinion, f^4, idler, f^5, and gear, F^5; the rake-teeth being raised while the anti-friction roll is traveling on the raised periphery of the cam and being carried down either by the force of the spring, f^6, coiled around the rake-head, or by the weight of the lever itself whenever the anti-friction roll on the latter enters the cut away portion of the cam, and the timing being such that the teeth descend immediately following the delivery of the nested circulars from the two preceding feed-channels and carry them against the gage-stop or stops rising from the outer side-guard of the third channel and adjustably therewith. This rake-head, like the first, has an adjustable tappet-arm, F^6, sleeved thereon and clamped in radial adjustment by a set-screw or otherwise, and arranged to strike an arm, f^7, from an oscillating shaft, F^7, carrying a butter, F^8, suspended by rods, f^8, from said shaft and filling a gap through the inner side-guard of the secondary channel above the third channel, and acting to place or position the material delivered thereover by the secondary rake for the action of the second set of folding-rolls. A stop, f^9, may also be secured to the rake-head in position to strike against the frame and limit its play.

The third channel, G, which is at right angles with the second one and therefore parallel with the first, will, as a rule, be the last one needed. It has, as above suggested, a conveyer belt or belts G', provided with a series of perforations, g, and teeth, g', which when but one belt is used, as shown, will be set abreast in pairs, side-guards, g^2, adjustable by means of sleeved sockets, g^3, and right and left screw-rods, G^2, and is supplied from feed-tables, G^3, arranged along its sides. Motion is imparted to the belt by a toothed drum, g^4, on a shaft, G^4, connected by a short diagonal shaft, G^5, and bevel gears, g^5, g^6, with the drum-shaft, B^2, of the primary feed-channel, (Figs. 3 and 5,) and at the opposite end the belt is passed over a drum on an idle shaft as usual. The folded material from the preceding channels being nested upon that fed to this third channel from its own feed-tables will be carried by the conveyers therein against a gage-stop or stops, G^6, which may be adjustable by means of slots and set screws, g^7, or otherwise, as shown in Fig. 3, to stay the material in position for the final folding. As in the preceding feed-channels an oscillating rake-head, H, will be mounted above the delivery end of the conveyer-belt or belts of this last channel, provided with a suitable and preferably adjustable stop-arm, h, depending flexibly tipped fingers, h', to carry the nested material into its position, and also with an adjustable tappet-arm, H', to strike an arm, h^2, from a rock-shaft, H^2, carrying a butter, H^3, to close a gap in one of the side guards and to force the material against the other side-guard as it is carried home by the rake-teeth, and thus straighten it out. The rake-head may be rocked by means of a crank-arm, h^3, at its end, to which is hinged a link, H^4, slotted to take over the end of the drum-shaft, G^4, which actuates the last conveyer, and having an anti-friction roll, h^4, that travels on the periphery of a cam, H^5, loosely mounted on said shaft, as it must be timed differently. A pinion, h^5, fixed to the shaft drives a gear, H^6, on a stub-axle, h^6, from the frame, and a pinion, h^7, fixed to this gear drives back upon a gear, H^7, fixed to the face of the cam, but loose upon the shaft, thereby actuating the rake at the proper intervals. A spring, h^8, coiled around the rake-head holds the anti-friction roll down upon the cam, so far as the stop-arm from said head will permit.

The mechanism for the final fold in the main resembles that described in Letters Patent No. 455,065, granted Timothy Stebbins and James R. McDonald on the 30th day of June, 1891, but contain certain improvements. It has a bed, K, which is raised and allowed to fall by a cam, K', on the cam-shaft. It also has folding-blades, k, k', actuated by el-

bow-levers, K^2, operated by appropriate cams. That blade, (k,) however, which first moves is long, so as to smooth down the first fold, and prevent it from being crumpled or dog-eared by the second blade (k'), which is short to avoid interference. The material is carried down upon the bed-plate by a four motion paddle, K^3, operated as in said patent. Provision, however, is made by means of set screws, k^2, between the shank of the supporting stud, K^4, of the bed-plate and the plate proper for the adjustment of the latter up or down, and therefore the coiled spring heretofore employed, is or may be omitted. A stop, k^3, is secured to the rear end of the folding-bed and the folding-paddle is slotted to pass each side of the slot, so that when it is withdrawn from the folded material after the action of the folding-blades, this stop may prevent such material from following, and in effect act as a stripper. Such stop is to be distinguished from the adjustable stop on either side of the folding-bed adjustable along the frame-work or bench, and not necessarily in line with the stop upon the bed, since these adjustable stops determine the position in which the material is delivered, while the stop upon the bed itself merely acts as a stripper to prevent the paddle from carrying the material off of the bed as it is retracted.

The elbow-levers which actuate the folding-blade are formed as shown in Fig. 4 so as to bridge the space on each side of the folding-bed and the bridge-bar, K^5, of the lever actuating the inner tucker-blade is provided with an upwardly projecting finger, k^4, which passes through a slot in the shank or tang, k^5, of said inner blade, as shown in the sixth figure, while the bridge-bar, K^6, of the outer lever has a depending central tongue, k^6, (Fig. 4) which also enters a slot at the end of the shank of the outer folding-blade. The power-arm of the inner lever has, at its end, an anti-friction roll which rides upon a peripheral cam, K^7, a part of which is covered by a guard, k^7, in order that the lever may be positively retracted (see Fig. 9) and the power-arm of the outer lever likewise has an anti-friction-roll at its end which rides upon the periphery of a second cam, K^8, having guard, k^8, (see Fig. 10,) for the same object. These cams are so timed that they will move first the inner folding blade and then the outer, the action of the folding-blades being succeeded as soon as the folding-bed descends to the level of the horizontal plane which passes between the two pairs of pressing or squeezing rolls, by the ejector-fingers or blades, L, pivoted to the upper end of arms, L′, secured to the rock-shaft, l, and advanced through the medium of the arm, l', from said shaft, and the peripheral cam, L^2, (Figs. 4 and 8) upon which an anti-friction roll from said arm takes, so that said ejector-fingers or blades catch in behind the half folded outer flap and press the material from the folding bed in between the pressing rolls and are then withdrawn by the guard, l^2, covering the retreating reach of said cam. A spring, l^3, connecting the supporting arms with the framework serves to retain the anti-friction roll constantly in contact with the periphery of the cam. The ejector-fingers being pivoted to their vibrating supporting arm have to be controlled so as to sweep the bed horizontally, and for this purpose they are formed with a tang or tangs, $l^\times$, of cam outline which pass between a suitable guide or guides, in the present instance shown as composed of two parallel rods, L^3, embracing the tang or tangs above and beneath. The presser-rolls, just above mentioned, are driven by trains of gears, l^4, l^5, such as described in the above mentioned patent of June 30, 1891, through the instrumentality of a short shaft L^4, which is engaged with the large gear-wheel, F^5, on the cam-shaft by pinion, L^5, and drives the first gear, L^6, in the primary train by means of a pinion, l^6, (see Fig. 12,) the second train being at the opposite end of the rolls. The material taken between the squeezing or pressing rolls is or may be delivered by them to a conveyer-belt, L^7, to be carried to an enveloping machine or suitable receptacle.

As already intimated there is a knife-blade to each set of folding-rolls, which descends between the two parallel rolls. The blade for the primary set of folding rolls, or that set which receives from the primary feed-channel, is sustained by a vertically reciprocating bar, M, moving in guides, m, secured to the frame or bench and is provided with a gage-screw, m', which can be set to determine the limit of its descent. The lower end of the reciprocating knife-bar is provided with an anti-friction roller, m^2, acted upon by one arm of a lever, M′, which is journaled upon a shaft, M^2, suspended by hangers beneath the bench, the other arm of said lever being acted upon by a cam, M^3, on the cam-shaft, so that when the anti-friction roller, m^3, rides upon the raised surface, m^4, of the cam, the knife will be held elevated, but when it enters the cut-away portion, m^5, the knife will fall by gravity. The knife-blade for the secondary set of folding rollers, or that to which the secondary feed channel delivers, is also raised and lowered by the action of lever, N, of the second order, pivoted upon the same shaft as the lever just mentioned and having an anti-friction roller, n, which travels upon the periphery of a second cam, N′, on said cam-shaft to push against the lower end of a vertical sliding bar, N^2, sustained in guides, n', n^2, and carrying the knife at its upper end, lifting it out of action when pushed up by the raised reach, n^3, of the cam, and falling by gravity when the cut away or retreating reach, n^4, comes around, the knife being, like the other gaged as to its fall by a set screw or gage-screw. In the present construction described for the purpose of this case, a third folding-knife is not required, as there is not a third set of folding rolls, but should the

terminal folding devices be so altered or replaced as to require folding rollers and a vertically moving knife, similar provision may be made for its action.

Sometimes it is desirable to inclose a card with the folded material. In order that this may be covered by the final fold, wings, P, are provided one at each side of the channel immediately above the folding-bed. These are hinged to brackets, P′, and kept by means of springs, *p*, in a normally horizontal position at some distance above the path of delivery of the material from that channel, but below the path of the paddle in its forward movement or advance over the bed. A card being laid upon these wings the paddle advances over it and as it descends carries the card with it, the wings yielding for that purpose. The further descent of the paddle presses the card down in the center of the partly folded material and upon the bed and continuing to descend with the bed, the folding-blades, in making the final fold, close the flaps over this card.

It will be understood that I do not intend to limit myself to any specific number of feed-channels, or their respective sets of folding-rolls, provided the conveyers of each channel, with its rolls, deliver to a succeeding channel and are so timed as to nest the folded material which is delivered with that being carried onward by the conveyers of the succeeding channel; nor do I intend to confine myself to the number of conveyer belts in a channel intending to use one or more according to the width, nor to forming such belts of leather, nor to the specific means for adjusting the side guides of the channels; nor to the employment of the paddle folding mechanism as the final folding apparatus of the machine; but

What I do claim, and desire to secure by Letters Patent, is—

1. The combination substantially as hereinbefore set forth, of the primary feed-channel having suitable conveyers, its feed-table, the folding devices to which said conveyers deliver, a secondary feed-channel arranged transversely at the end of the primary channel, and in a different plane therefrom, to receive directly from its folding rollers, a feed-table from which material may be fed to the receiving end of said secondary channel, a conveyer or conveyers in said secondary feed-channel timed in such manner as to bring the material fed thereto beneath the folding rolls of the primary channel as folded material is delivered from said rolls, and assemble such material, and folding devices to which the conveyers of the secondary channel carry and deliver said assembled material.

2. The combination substantially as hereinbefore set forth, with the side guards of the feed channels and the sockets attached thereto, of the screw-threaded sockets upon the adjusting screws and pins connecting the two sockets whereby said side-bars can be readily removed.

3. The combination, substantially as hereinbefore set forth, with a feed-channel and conveyers working therein, and with the folding devices and gage stops to which said conveyers deliver, of adjustable side guards to said channel, and an oscilating butter constituting a section of one of said guards and acting toward the opposite guard.

4. The combination substantially as hereinbefore set forth, with the feed-channels and their side guards and the oscillating rakes at the delivery end of the conveyers, of the folding devices, the gage-stops and oscillating butter.

5. The combination substantially as hereinbefore set forth, with the feed channels and their conveyers and adjustable side guards of the oscillating rake at the delivery end of the conveyers, the tappet-arm on the rake-head, the butter and its rock-shaft supported from one of the said side guards and the arm from said side-guards against which the tappet on the rake-head strikes.

6. The combination substantially as hereinbefore set forth, of the primary feed-channel having conveyers, folding devices to which it delivers, a transverse feed channel at the end of the primary feed channel provided with conveyers and adjustable side guards, and stops secured to the outermost of said side guards so as to be adjusted therewith.

7. The combination substantially as hereinbefore set forth, with the primary feed-channel and the secondary feed channel at right angles thereto, of the folding rollers and knife, and adjustable side-guards to said secondary feed-channel and the gage-stops for the primary channel, and secured to the outer side guards thereof of said secondary channel.

8. The combination substantially as hereinbefore set forth, with the feed-channel, its conveyers, the folding devices to which it delivers and the stops, of the rake having flexible teeth.

9. The combination, substantially as hereinbefore set forth, with the folding bed and folding devices acting in connection therewith, of the ejectors pivoted to arms secured to a rock-shaft beneath the cam-shaft, guides for the ejectors, and an arm from said rock-shaft engaging with a cam upon the cam-shaft whereby said ejector is operated.

10. The combination substantially as hereinbefore set forth, with the folding-bed and rising and falling folding blades and terminal squeezing and pressing rolls, of the ejectors having a cam-shaped tang and the guide through which said tang passes.

11. The combination substantially as hereinbefore set forth, with a feed-channel and folding devices to which it delivers, of a secondary feed-channel to which said folding devices deliver, a rake at the delivery end of the first feed-channel, a rock-shaft carrying a

butter, an adjustable arm or tappet on the rake-head and a projecting arm from the rock-shaft against which said adjustable tappet strikes.

12. The combination substantially as hereinbefore set forth, with the feed-channel having a conveyer or conveyers, the folding-bed, folding-blades and paddle, of the elastically yielding wings above said folding-bed, and below the upper plane of movement of the paddle in its advance over the bed.

13. The combination substantially as hereinbefore set forth, with the folding-bed and folding-blades, and with the longitudinally slotted folding-paddle, of the fixed stop on the folding-bed acting to serve as a stripper when the folding-blade is withdrawn.

14. The combination, substantially as hereinbefore set forth, with the folding-bed, folding-blades and paddle or former, of a folding-bed and means for adjusting it relative to said paddle.

15. The combination, substantially as hereinbefore set forth, with the folding-blades and the paddle or former of the folding-bed and the stud entering the socket therein and the adjusting screws between the shank of said stud and the folding-bed.

16. The combination substantially as hereinbefore set forth, of the feed-channel, endless belt, conveyers moving therealong and having teeth, folding-rollers over which said conveyers deliver, extension strips alongside said rollers, adjustable stops and a rake for carrying the material inward from the conveyer-belts to the adjustable stops.

17. The combination substantially as hereinbefore set forth, with the conveyer-belts and folding-rollers, of the rake having teeth flexibly tipped and gage-stops against which said rake carries the material to be folded.

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