6 Sheets—Sheet 1.

G. LAUDER.

Paper-Folding Machine.

No. 208,831. Patented Oct. 8, 1878.

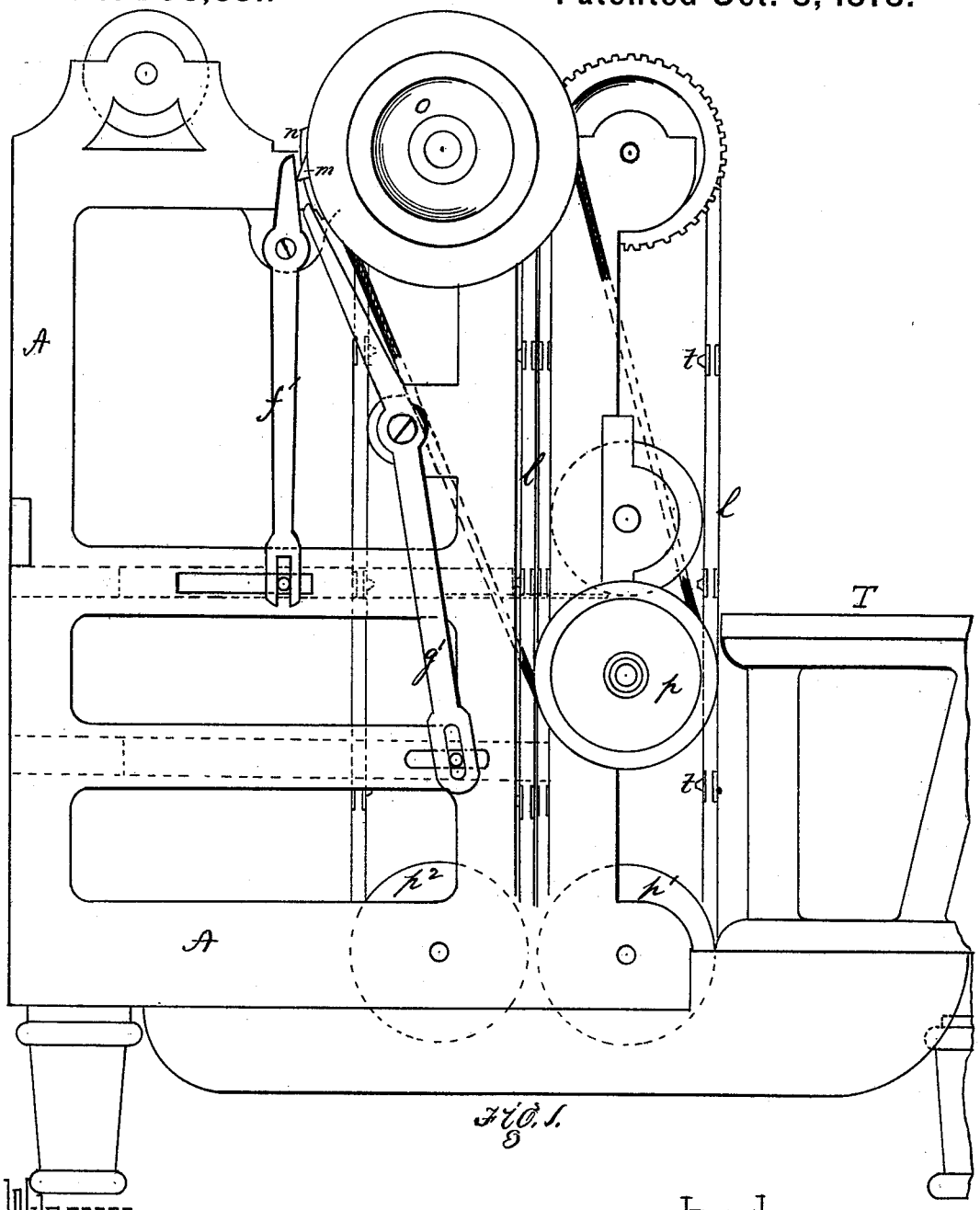

FIG. 1.

WITNESSES.

R. A. Wroshall
Jno. C. Smith

INVENTOR.

George Lauder
by Bakewell & Kerr
Attys

6 Sheets—Sheet 2.

G. LAUDER.

Paper-Folding Machine.

No. 208,831 Patented Oct. 8, 1878.

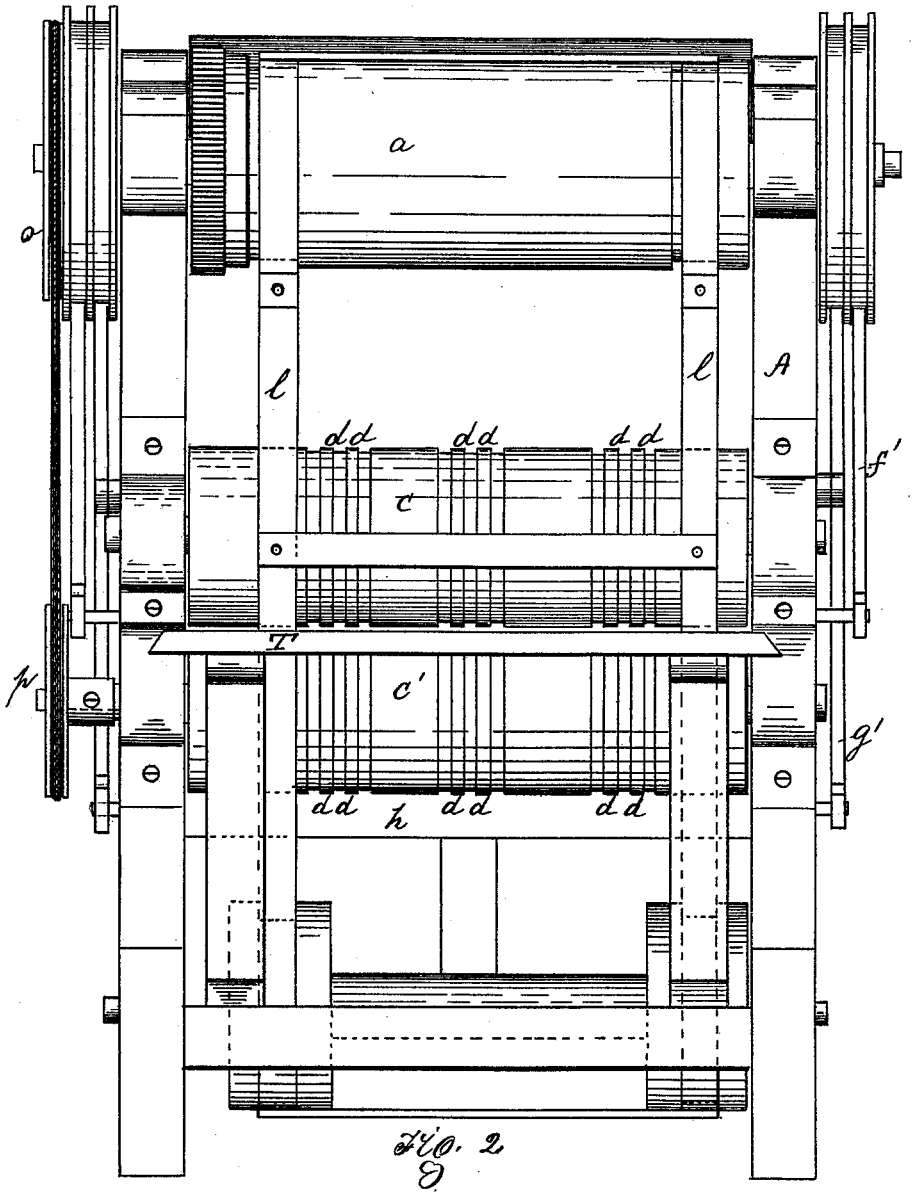

FIG. 2.

WITNESSES.

R. F. Whitehead
Jno. K. Smith

INVENTOR.

George Lauder
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6 Sheets—Sheet 3.

G. LAUDER.

Paper-Folding Machine.

No. 208,831. Patented Oct. 8, 1878.

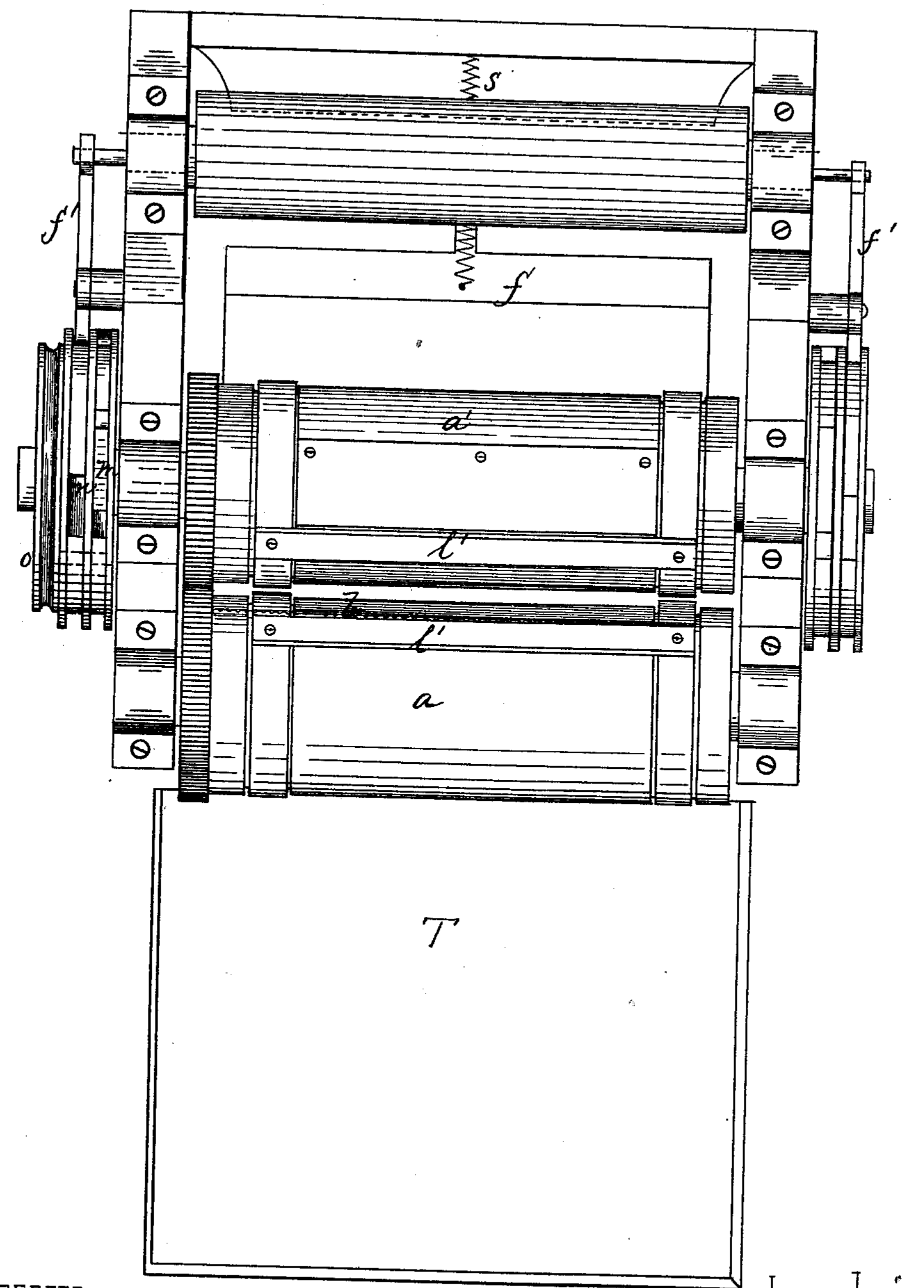

Fig. 3

Witnesses

R. C. Winshaw

Jno. K. Smith

Inventor

George Lauder

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G. LAUDER.

Paper-Folding Machine.

No. 208,831. **Patented Oct. 8, 1878.**

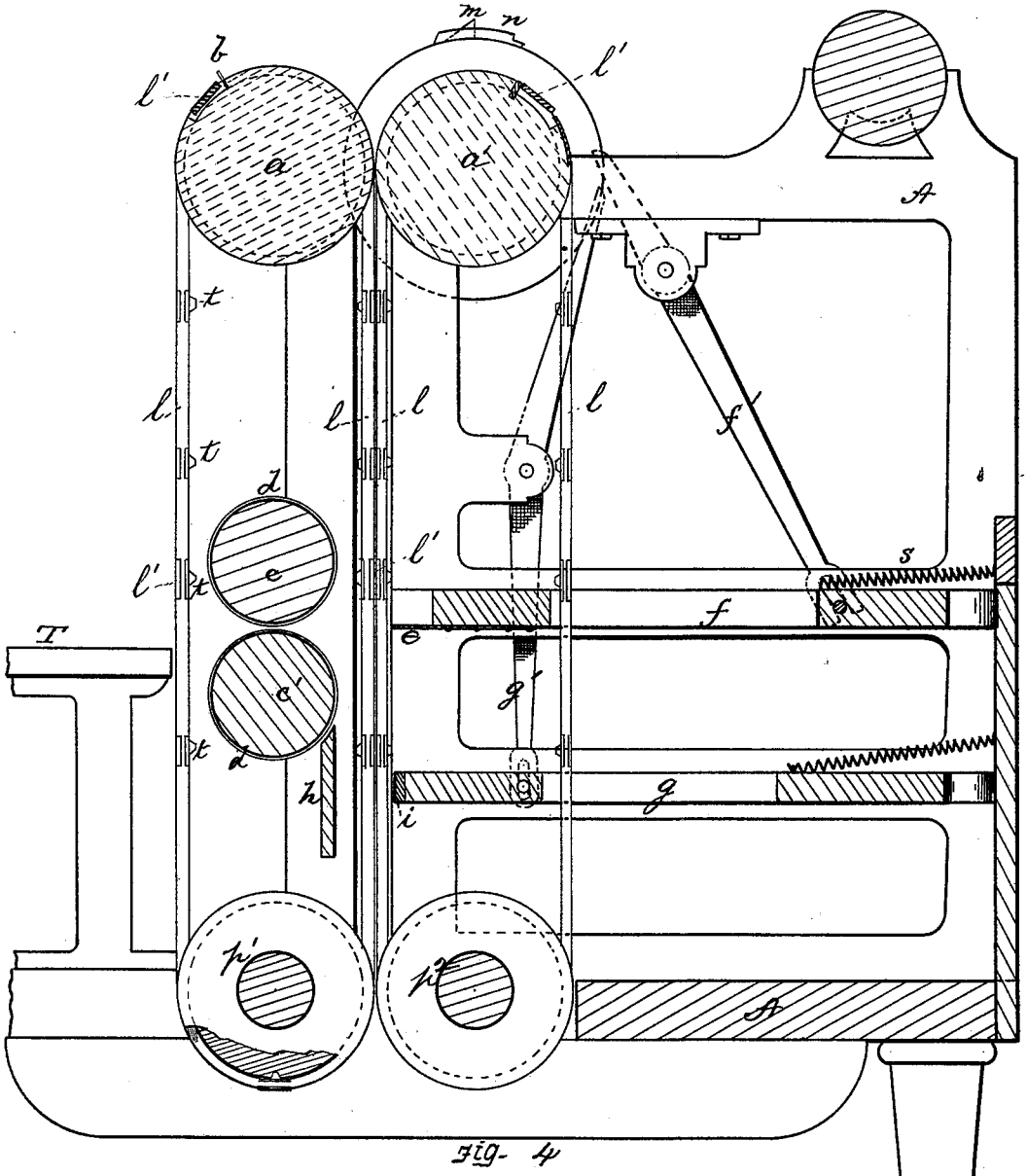

Fig. 4

Witnesses.

R. W. Wrenshall

Jno. K. Smith

Inventor.

George Lauder

by Bakewell & Kerr

Atty's

6 Sheets—Sheet 5.

G. LAUDER.

Paper-Folding Machine.

No. 208,831. **Patented Oct. 8, 1878.**

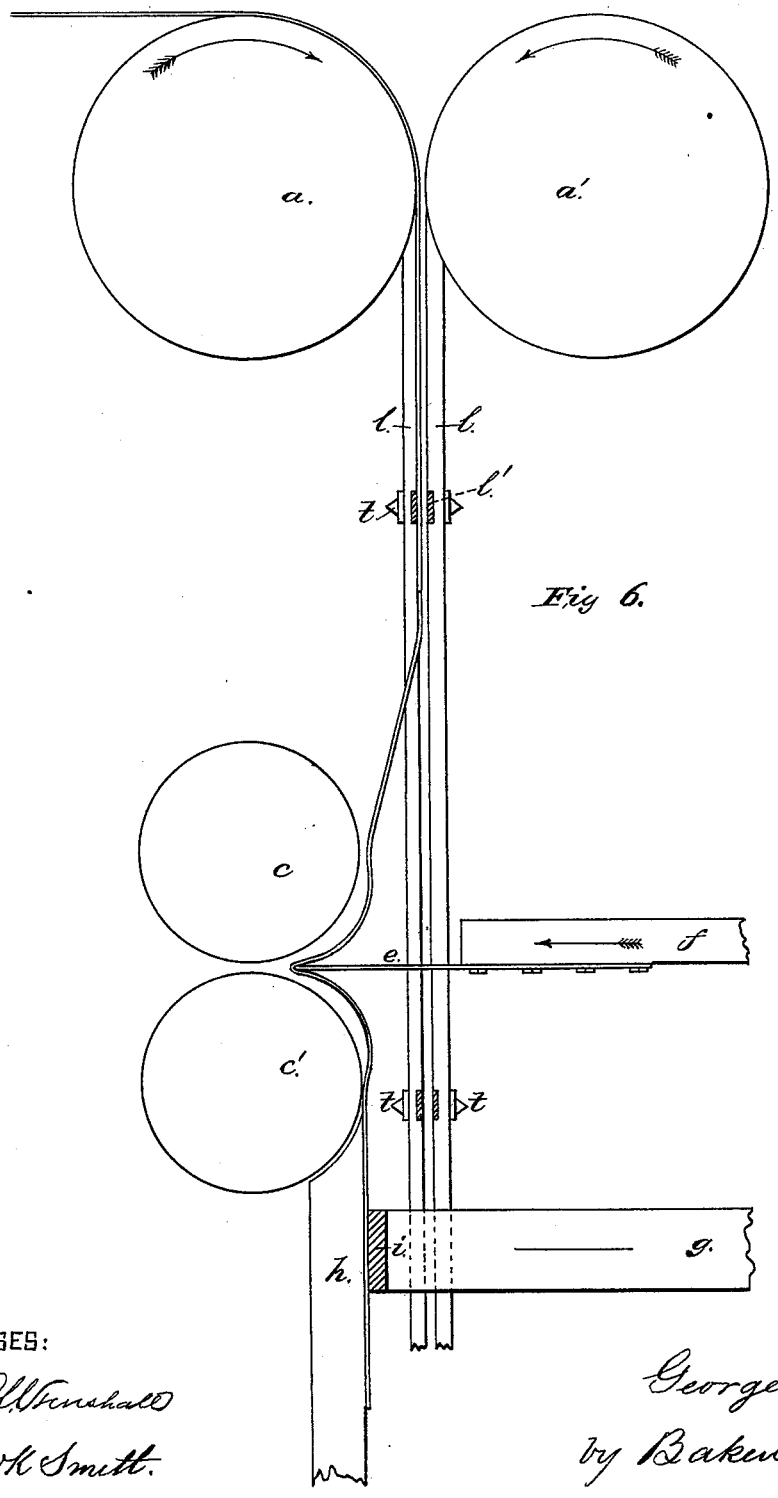

Fig 6.

WITNESSES:

R. C. L. Marshall

J. W. K. Smith.

INVENTOR:

George Lauder

by Bakewell & Kerr

Attys.

6 Sheets—Sheet 6.

G. LAUDER.

Paper-Folding Machine.

No. 208,831. Patented Oct. 8, 1878.

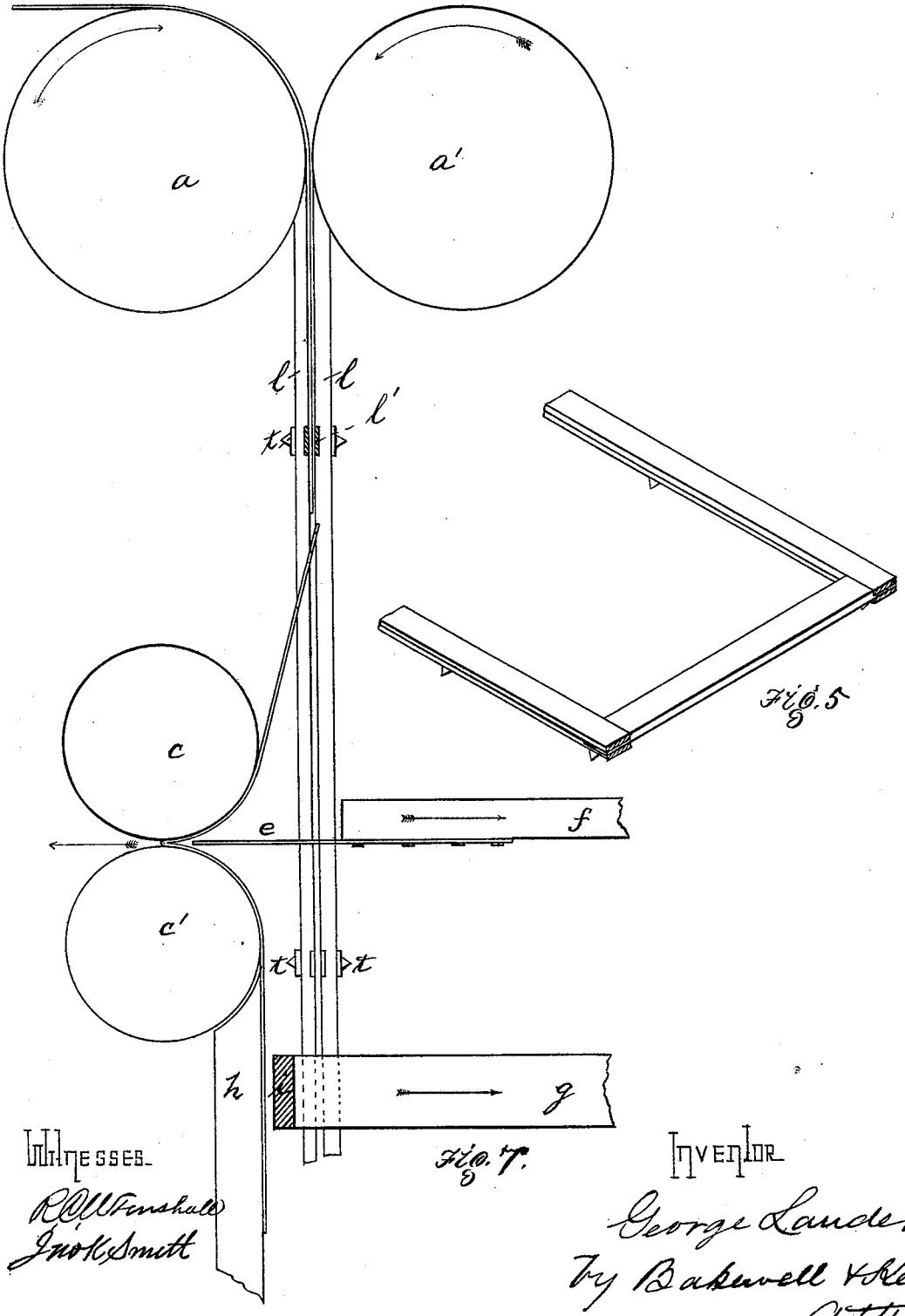

Fig. 5

Fig. 7.

Witnesses.
R. W. Marshall
Jno. K. Smith

Inventor.
George Lauder
by Bakewell & Kerr
Attys

UNITED STATES PATENT OFFICE.

GEORGE LAUDER, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN PAPER-FOLDING MACHINES.

Specification forming part of Letters Patent No. **208,831**, dated October 8, 1878; application filed August 6, 1878.

To all whom it may concern:

Be it known that I, GEORGE LAUDER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Paper-Folding Machines; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 is a side elevation of devices embodying my invention. Fig. 2 is a view of the delivery end of the machine. Fig. 3 is a top view. Fig. 4 is a vertical section, showing the folding-blade and griper retracted or at rest. Fig. 5 is a detail view, showing the preferred construction of belts and cross-bars for controlling the leading end of the sheet. Fig. 6 is a diagram, showing the sheet clamped by the griper-bar and bagged before the rollers, with the folding-blade partially advanced. Fig. 7 is a diagram, showing the bar and blade retreating and the folded sheet in the bite of the rollers.

My invention relates to devices for folding paper, &c., and to the method of operating the same.

Heretofore in the construction of paper and like folding-machines, so far as I am aware, the sheet to be folded has been permitted to travel continuously past the folding mechanism until the center or the point or line of creasing or folding was opposite the bite or gripe of the folding mechanism, thereby delaying the action of the knife or folding-blade, and causing a direct strain to be put on the paper by the necessarily quick stroke of the folding-knife. The class of machines in which this defect is most marked may be broadly stated to be those wherein rolls or tapes and a reciprocating folding-blade are employed.

To overcome said objections and obtain a folder which could be employed to fold a continuous web continuously fed, as, for instance, from a rotary press, the rotary folder was devised—that is to say, a folder wherein two rolls, one provided with a tongue and the other with a griper, were employed, the paper being creased by the blade of one roll and pushed into the griper of the other roll along the desired line of fold, the rotation of the latter roll carrying the sheet out of the line of feed, thus permitting a continuous feed, or the folding of sheets severed from a web.

This last method, while theoretically correct, and apparently capable of permitting the maximum speed to be attained in folding, has serious defects when practically applied—namely, the condition of the web as it comes from the press is such that it is easily torn or distorted if too great strain is put thereon, and the "rotary folder," as it is now termed, cannot be run at the maximum speed without liability of rupturing the sheets along the line of fold. In connection with said objection are other material ones, such as the complex nature of the machine, the difficulty of keeping it in good running order, and the first cost of construction.

I will now proceed to specifically describe devices illustrating my invention, so that others skilled in the art to which it appertains may apply it.

In the drawing, A represents a suitable frame adapted to support the operative parts of a machine. In said frame are journaled two rollers, *a a'*, one of which is provided with a knife or equivalent device, *b*, to perforate the paper, the opposite roll being recessed or otherwise constructed to coact therewith. On the shaft of one of said rollers *a a'* are cams *m n*, for purposes hereinafter set forth, and a pulley, *o*, or equivalent means, for transmitting power to the folding-roll. Said rollers may constitute feed-rolls, as well as the cutting mechanism, as in the present instance; but, if preferred, independent feed-rolls (not shown) may be added. Journaled in the frame A in line with the feed of rollers *a a'* are a pair of ordinary folding-rolls, *c c'*, provided, if desired, with tapes, or fitted with bands *d*, as shown, to increase their gripe upon the sheet to be folded, one of said rolls being driven, preferably, from the feed-roll or cutter-roll, as the case may be, and by means of pulley *p*, or other suitable mechanism, which will permit of said rolls being driven at greater surface-speed than the feed-rolls.

Opposite the bite of the folding-rolls is arranged the folding-blade *e*, secured to a sliding frame, *f*, to which motion is imparted,

through pivoted lever f', from the cam m, and by means of spring s, or its equivalent, such as a weight, &c.

g indicates a second slide, arranged in the main frame A, which is also operated from the feed roller by pivoted lever g' and cam n, said frame or slide coacting with a cross-bar, h, or equivalent device, to seize the leading end of the sheet and arrest its motion, so as to cause the sheet to bag opposite the folding-rolls. This bar is arranged in the line of feed at a point beyond the bite of the folding-rolls, and the slide or griper is preferably tipped with rubber, felt, or equivalent substance, i, to render its action more sure and perfect.

The elements above specified, or their equivalents, constitute the essentials of my machine; but an additional feature, which I will now describe, may in many instances be added with good result.

It will frequently happen that, owing to the condition of the paper, it will not feed with the precision desired for neat and accurate folding. In order to obviate this difficulty whenever it arises, I provide belts or bands l with a series of cross-bars, l', placed equidistant the length of the sheet to be folded, said bands being provided with teeth t, which gear with grooves formed in the rolls a a' and in pulleys p^1 p^2, thus preventing the slipping of the belts and insuring uniform travel thereof, whereby the cross-bars of each set will register one with the other, and a cross-bar of each set of belts will register just back of the cutter at each operation thereof, so as to seize the leading end of the sheet and guide the same properly.

The best construction to give the desired strength and overcome tendency of the belts to stretch will be found to be that shown in detail, Fig. 5—that is to say, two belts riveted together and the cross-bar let into the belts at its ends. When the devices last described are omitted, it will be advisable to arrange guides or guide-walls between the perforating and folding rolls to prevent the deflection of the sheet.

T indicates a table for the reception of the folded sheets, but in lieu thereof a series of rolls, tapes, and folding-blades of the ordinary construction or any approved form, adapted to give the desired number of additional folds, may be substituted.

So far as I am at present able to determine, to obtain the best results from the mechanism specified, the stop or griper should be set somewhat beyond the axis or journal of the distant folding-roll. The distance between the feed or cutting rolls and the bite of the folding-rolls should exceed the length of half the sheet to be folded, more or less. The cam of the stop or griper should be abrupt, and set so as to operate the stop when sufficient of the sheet to be folded has passed the bite of the folding-rolls; and the knife should have a gradual forward movement, commencing slightly later than the griper or stop, so as to carry the paper into the bite of the folding-rolls without force, and a quick return movement simultaneous with the return movement of the stop or griper, so as to present no obstruction to the subsequent movement of the sheet through the folding-rolls.

A machine such as described, or its equivalent, will operate as follows: The web (or sheet) being fed to the cutters will be perforated at regular intervals thereby, and the leading end will advance until it passes the bite of the folding-rolls, when the stop will operate, arresting the motion of the leading end of the sheet until the sheet bags or sufficient slack is formed, at which time the knife will commence to operate, carrying the slack or loose portion of the sheet into the bite of the folding-rolls, whose superior speed will separate the sheet from the web, both stop and knife withdrawing at the same time, and so as not to obstruct either the continuous feed or the action of the folding-rolls. This operation is repeated from time to time at the instant the leading end of every sheet passes the stop. When the belts and cross-bars are used, the cross-bars will seize the leading end of each sheet and carry it past the stop, the stop operating the instant the cross-bar passes the same, and the operation of the other mechanism being the same as before specified.

The advantages of my invention are the great speed at which the folding-blade can be operated successfully, and the avoidance of strain and non-liability to tear the web during rapid folding.

I am aware that fixed stops have been employed for registering sheets to be folded, and also that sheet-controlling devices adapted to intercept and temporarily arrest or check the motion of succeeding sheets has heretofore been devised, and do not claim devices arranged to so operate, because they simply register the sheet in one instance, and in the other slow up its motion to the registering-point, while in my case a positive bagging of the sheet opposite the folding devices is required and produced.

Having thus described the nature and advantages of my invention, what I claim, and desire to secure by Letters Patent, is—

1. The method herein described of folding paper, which consists in arresting the motion of the leading end of the sheet, so that the sheet shall swell or bag opposite the bite of the folding-rolls, and causing the folding-blade to act upon the paper during the time of feed and while the end is thus held, substantially as specified.

2. The combination, in a folding-machine, of feeding mechanism for feeding a perforated web, mechanism, substantially as described, adapted to gripe the leading end of a sheet and to cause the sheet to bag opposite the folding devices, folding-rolls, and a device or devices, substantially as specified, to enter the

sheet between the folding-rolls, whereby the end of the sheet is held by the griper, substantially as specified.

3. The combination, in a folding-machine, of devices for perforating a web or dividing the same into sheets, devices, substantially as described, adapted to arrest the travel of the leading end of a sheet and to cause the sheet to swell or bag opposite the folding-rolls, and mechanism for entering the sheet between the folding-rolls, the whole constructed and adapted to operate substantially as set forth.

4. The combination, in a folding-machine, of feeding mechanism for feeding the sheet, mechanism for controlling the leading end of the sheet, mechanism, substantially as described, for arresting the leading end of the sheet to cause the sheet to swell or bag opposite the folding-rolls, folding-rolls for folding the sheet, and mechanism for carrying the slack or swell of the sheet into the bite of the folding-rolls while the sheet is thus held, the whole constructed and operating substantially in the manner specified.

In testimony whereof I, the said GEORGE LAUDER, have hereunto set my hand.

GEORGE LAUDER.

Witnesses:

F. W. RITTER, JR.,

J. K. SMITH.