March 19, 1929. G. W. YOUNG 1,706,340

AUTOMATIC ROTARY GATHERING AND COLLATING MACHINE

Filed July 19, 1926 3 Sheets-Sheet 1

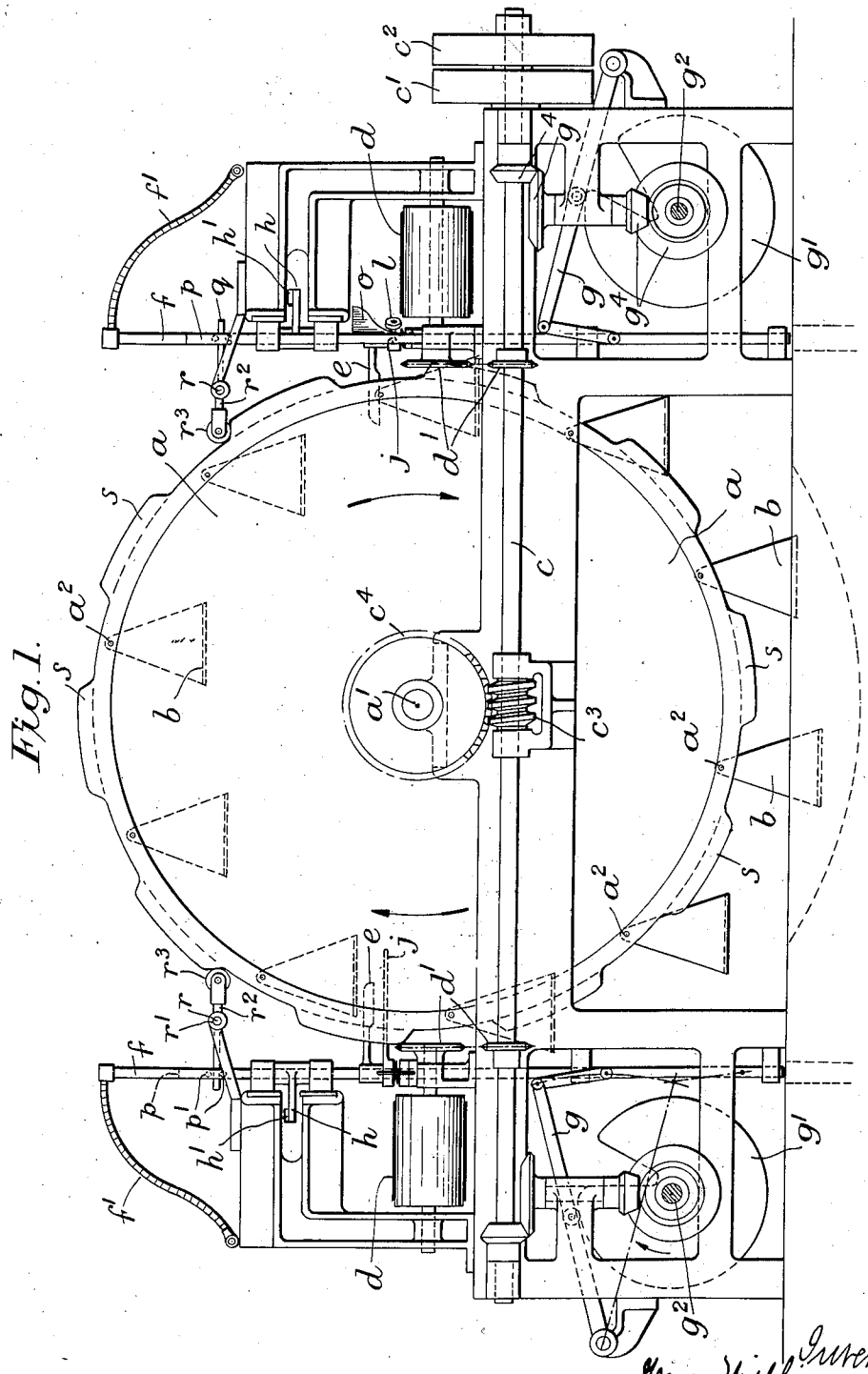


Fig. 1.

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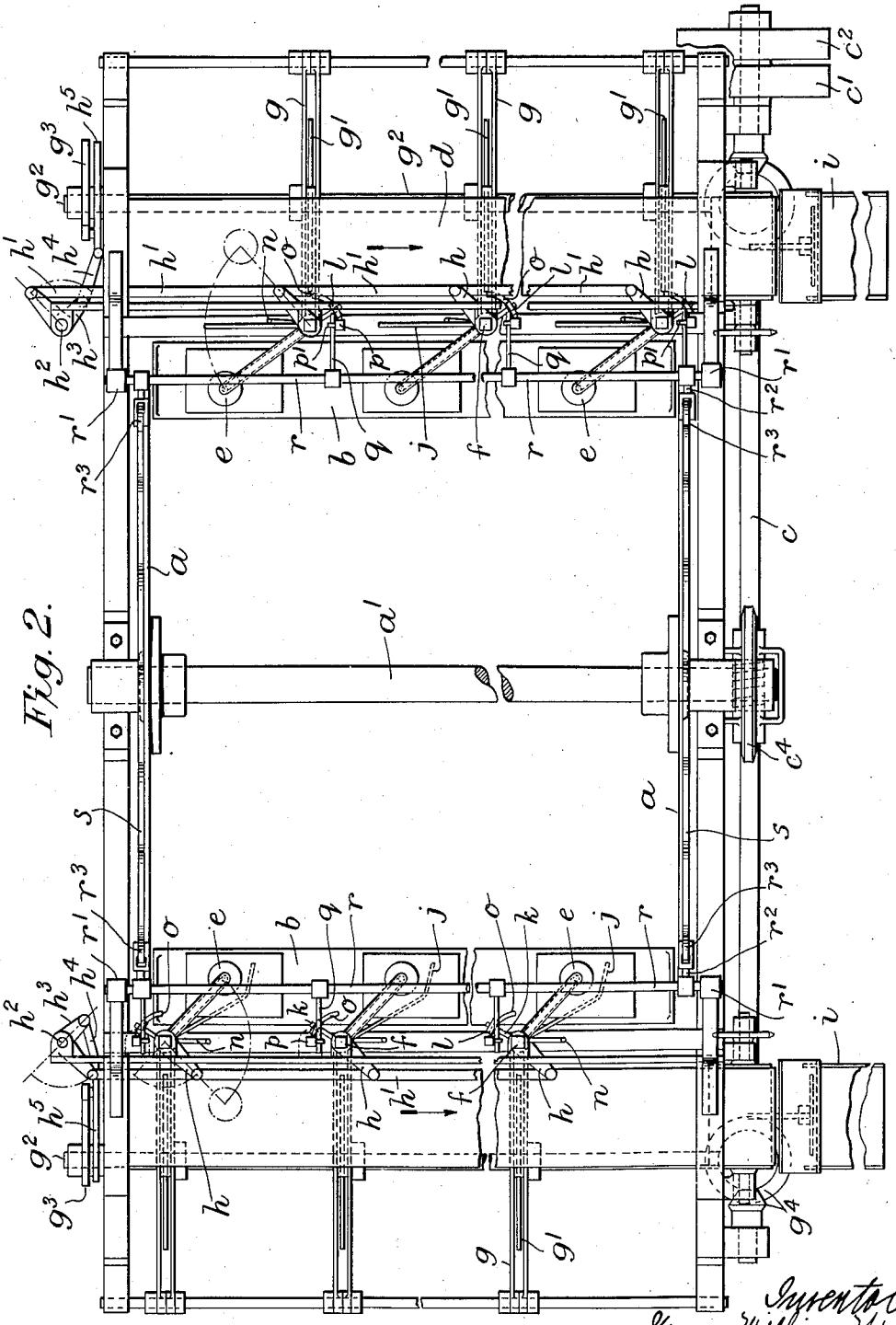


Fig. 2.

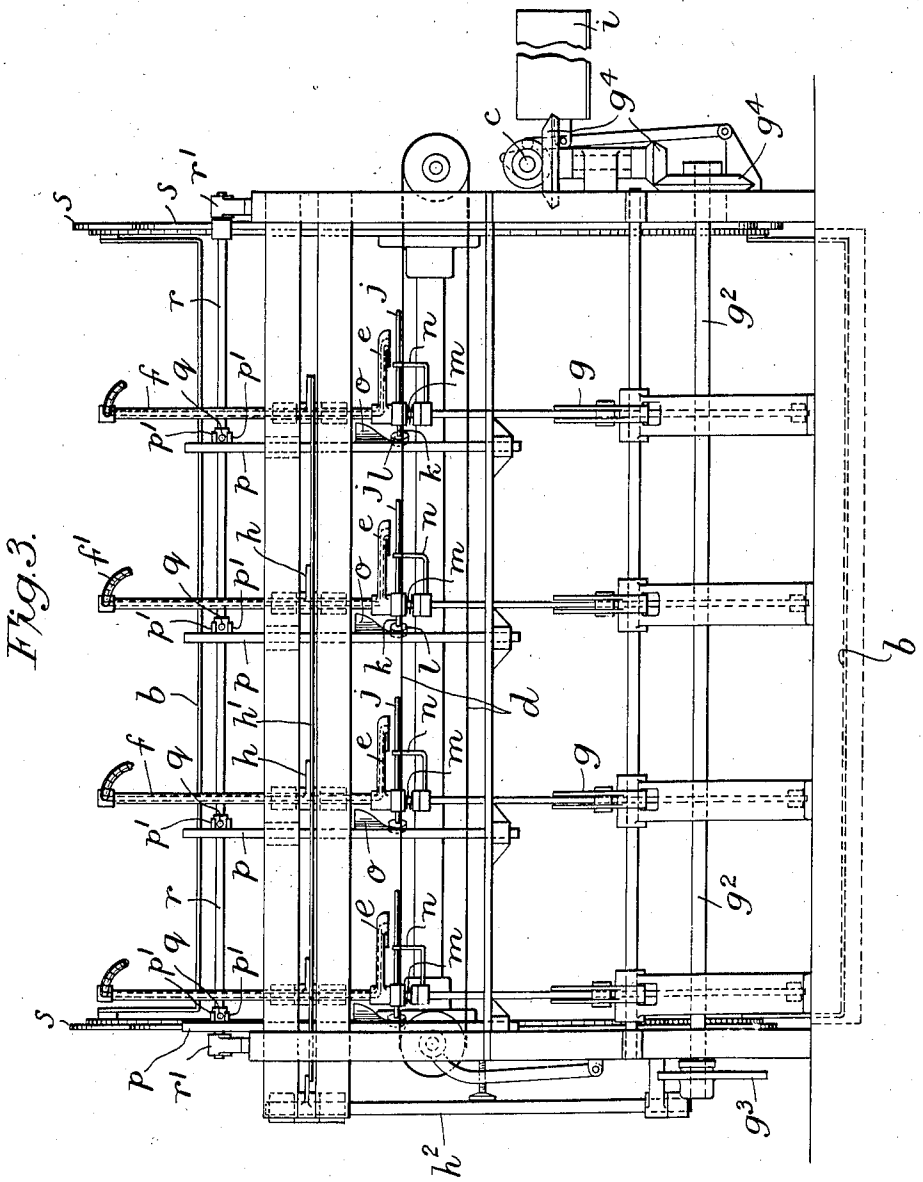
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AUTOMATIC ROTARY GATHERING AND COLLATING MACHINE

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Fig. 3.




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# UNITED STATES PATENT OFFICE.

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## AUTOMATIC ROTARY GATHERING AND COLLATING MACHINE.

Application filed July 19, 1926, Serial No. 123,458, and in Great Britain July 22, 1925.

This invention relates to automatic rotary gathering and collating machines comprising a rotary framework or carrier adapted to carry piles of sheets to be gathered and suction means adapted to pick up the top sheet from each pile and deposit it upon a conveyor ready for transport to a sheet collecting packer.

The present invention has for its object to provide an improved machine of the kind stated wherein the suction means for picking the sheets from off the piles execute a substantial vertical movement as well as a lateral movement in transferring the sheets to the conveyors. It is also an object of the invention to provide a machine of the kind stated which shall be especially adapted for handling folded sheets as well as single sheets.

Further objects of the invention are the provision of sheet lifting suction means which automatically adapt themselves to piles of sheets of various heights and the increase of the working capacity of the machine by providing two conveyors with associated sheet lifting means to each rotary carrier.

The improved machine according to this invention is characterized by sheet lifting suction devices which in transferring the sheets from the rotary carrier to the conveyor execute a substantial vertical movement. The invention is also characterized by the fact that during their said vertical movement the sheet lifting devices execute a lateral movement to bring the sheets to a position over the collating conveyor. A further feature of the invention is the provision of support fingers which participate in the movement of the sheet lifting suction devices and co-operate therewith in holding the sheets during their transit from the carrier to the conveyor.

The said lateral movement of the sheet lifting devices may consist of a rotation about a vertical axis or alternatively may consist of a simple reciprocatory movement in a straight line.

The rotary carrier for the piles of sheets is composed preferably of two wheel-like frames arranged at a suitable distance apart upon a common horizontal shaft, the frames having pivotally suspended from points spaced equally around their peripheries sheet carrying cradles. The cradles, each of which comprises a base with upstanding ends and means for hanging it from the frames, are preferably divided by adjustable partitions or equivalent means into compartments suitable for containing the piles of sheets to be gathered and collated.

The invention is hereinafter more fully described with reference to the accompanying drawings in which:

Fig. 1 is an end elevation of a preferred form of construction of my improved machine.

Fig. 2 is a plan, and

Fig. 3 is a side elevation of the same.

Referring to the drawings it will be seen that in the machine illustrated the rotary carrier comprises wheel-like frames $a$ coaxially arranged upon a shaft $a'$ and provided near the periphery with equally spaced pivots or bearings $a^2$ from which the sheet carrying cradles $b$ are pivotally suspended, these latter being if required divided into compartments for the different piles of sheets to be carried. A drive shaft $c$ extending across one end of the machine and provided with fast and loose pulleys $c'$, $c^2$, or other suitable control means, is operatively connected, as through the worm and worm wheel mechanism $c^3$, $c^4$ with the rotary carrier.

Along either side of the rotary carrier there is provided an endless band conveyor $d$ driven by chain and sprocket $d'$ or the like from the drive shaft $c$. These conveyors serve to receive the sheets from the suction devices and to convey them in the required sequence to the packers hereinafter described. The suction devices $e$ for lifting the sheets from the piles on the cradles $b$ are in this construction carried by arms projecting from vertical rods $f$ hereinafter referred to as suction columns. These columns $f$ are mounted between the conveyors $d$ and the rotary carrier of the machine and are arranged to slide and turn in their bearings to impart the required movements to the suction devices $e$.

In order to obtain the required rising and falling movements of the columns $f$ they are linked near their lower ends to levers $g$ which are acted upon by quick lifting cams $g'$ carried upon shafts $g^2$ located beneath the conveyors $d$.

These shafts $g^2$ are operatively connected by suitable mechanism, such as the bevel gearing shown at $g^4$, with the drive shaft $c$. Oscillatory motion in a circular path is imparted to the columns $f$ by levers $h$ which embrace

the upper parts thereof in a manner permitting relative sliding movement whilst preventing relative angular movement. These levers $h$ on either side of the machine are connected by coupling bars $h'$ to vertical shafts $h^2$ at the rear of the machine, and these latter are connected in turn through levers $h^3$ and links $h^4$ to forked slides $h^5$ embracing the rear ends of the shafts $g^2$ and oscillated by cams $g^3$ keyed thereon. The columns $f$ may conveniently be hollow and connected at their upper extermities by flexible tubes $f'$ to the means (not shown) for creating the suction so that they may serve as conduits for conveying the suction effects to the sheet lifting devices $e$.

The timing of these driving mechanisms is so arranged that when the cradles $b$ arrive at a suitable point adjacent one of the conveyor bands $d$ the associated sheet lifting devices $e$ are first lifted, then swung outwardly over the piles of sheets in the cradle and dropped so that the top sheet of each pile is engaged by a suction device $e$. The suction effect is then applied to the several sheet lifting devices by the operation of a mechanically actuated control valve (not shown) whereupon all the lifting devices are raised by the action of the cams $g'$ and swung around by the action of the cams $g^3$ to positions over the conveyor band $d$. On withdrawing the suction effect from the sheet lifting devices $e$ the sheets now fall on the conveyor band and are carried in definite order to a sheet packing rack $i$ at the discharge end of the conveyor, sufficient space being provided at the discharge end of the conveyor to enable an operator to overlook and check the collation of the sheets as they pass. Provision may be made for dropping all the sucked up sheets simultanenously on to the conveyor or the sheets may be dropped in succession as the conveyor travels along.

In order to prevent accidental displacement of the sheets from the lifting devices or the loss of any loose contents within the sheets during their transit from the cradles to the conveyors, this invention provides sheet supporting fingers $j$ adapted to cooperate with the lifting devices in holding the sheets. These fingers $j$ are pivotally mounted upon the columns $f$ at points just below the sheet lifting suction devices $e$ and are provided with tail levers $k$ carrying rollers $l$ which are adapted to co-operate with helical cam surfaces $o$ secured to square-section bars $p$, mounted to slide vertically, and arranged parallel with and to one side of the suction columns $f$. The bars $p$ are provided at their upper ends with pins or stops $p'$ between which arms $q$ are arranged to operate, which arms are secured to shafts $r$ journalled horizontally in bearings $r'$ above the sheet lifting suction devices $e$. At each end of the shafts $r$ are secured arms $r^2$ carrying rollers $r^3$ arranged to co-operate with cams $s$ provided on the periphery of the wheel-like frames $a$ of the rotary carrier.

The action of the cams $s$ upon the arms $r^2$, due to the rotation of the carrier, rocks the shaft $r$ in its bearings and the bars $p$ are alternately raised and lowered by the arms $q$ which engage with the upper set or the lower set, respectively of the pins $p'$ secured to the said bars.

The lowering of the bars $p$ brings the helical cam surfaces $o$ thereon into such a position that the rollers $l$ will run over the said cam surfaces during the upward vertical movement of the suction columns $f$. This movement of the columns $f$ therefore causes the supporting fingers $j$ to swing to a position beneath the suction devices $e$ against the action of coil springs $m$ arranged on the columns $f$, which springs tend to maintain the fingers in their inoperative position against stops $n$ secured to the columns $f$.

The cams $s$ are so disposed around the periphery of the rotary carrier that the downward movement of the bars $p$ coincides with the downward movement of the suction columns $f$, so that, when the suction devices have sucked up the top sheets of the piles carried on the cradles $b$ and begin to rise, the supporting fingers $j$ will be swung in beneath the said suction devices and co-operate therewith to hold the sheets in position.

The supporting fingers remain in their operative position, by reason of the helical cam surfaces $o$, until the suction devices $e$ are over the conveyors $d$, whereupon the said cam surfaces are raised by the arms $q$ thus disengaging the rollers $l$ and allowing the return of the fingers $j$ to their inoperative position under the action of the springs $m$, while the sheets are allowed to fall to the conveyor.

The provision of these sheet supporting fingers renders the machine more efficient especially when dealing with folded sheets which if unsupported from below tend to fall open and become detached from the suction devices, or allow the escape of any loose contents within the folded sheets.

As will be readily understood the duplicating of the conveyor and sheet transferring means greatly increases the capacity of the machine.

I claim:

1. A gathering and collating machine comprising a rotary carrier, cradles carried by the carrier, a conveyor, and a vertically and laterally movable sheet lifting suction device to transfer the sheets from the cradles to the conveyor.

2. A gathering and collating machine as claimed in claim 1 including also means to prevent casual displacement of the sheets during their transfer.

3. A gathering and collating machine as claimed in claim 1 in which sheet lifting

means and collating conveyors are provided on opposite sides of the carrier so that said carrier is common thereto.

4. A gathering and collacting machine as claimed in claim 1 in which sheet lifting means and collating conveyors are provided on opposite sides of the rotary carrier and a common driving shaft and driving mechanism are provided for the sheet lifting and transfer means, the carrier and the conveyors.

5. A gathering and collating machine as claimed in claim 1, including support fingers which participate in the movement of the sheet lifting suction devices and cooperate therewith in holding the sheets against displacement during their transit from the carrier to the conveyor.

In testimony whereof he has affixed his signature.

GEORGE WILLIAM YOUNG.