W. A. SPURRIER.

DRYING APPARATUS FOR PRINTED SHEETS OF PAPER.

APPLICATION FILED OCT. 18, 1911.

1,037,075. Patented Aug. 27, 1912.

2 SHEETS—SHEET 1.

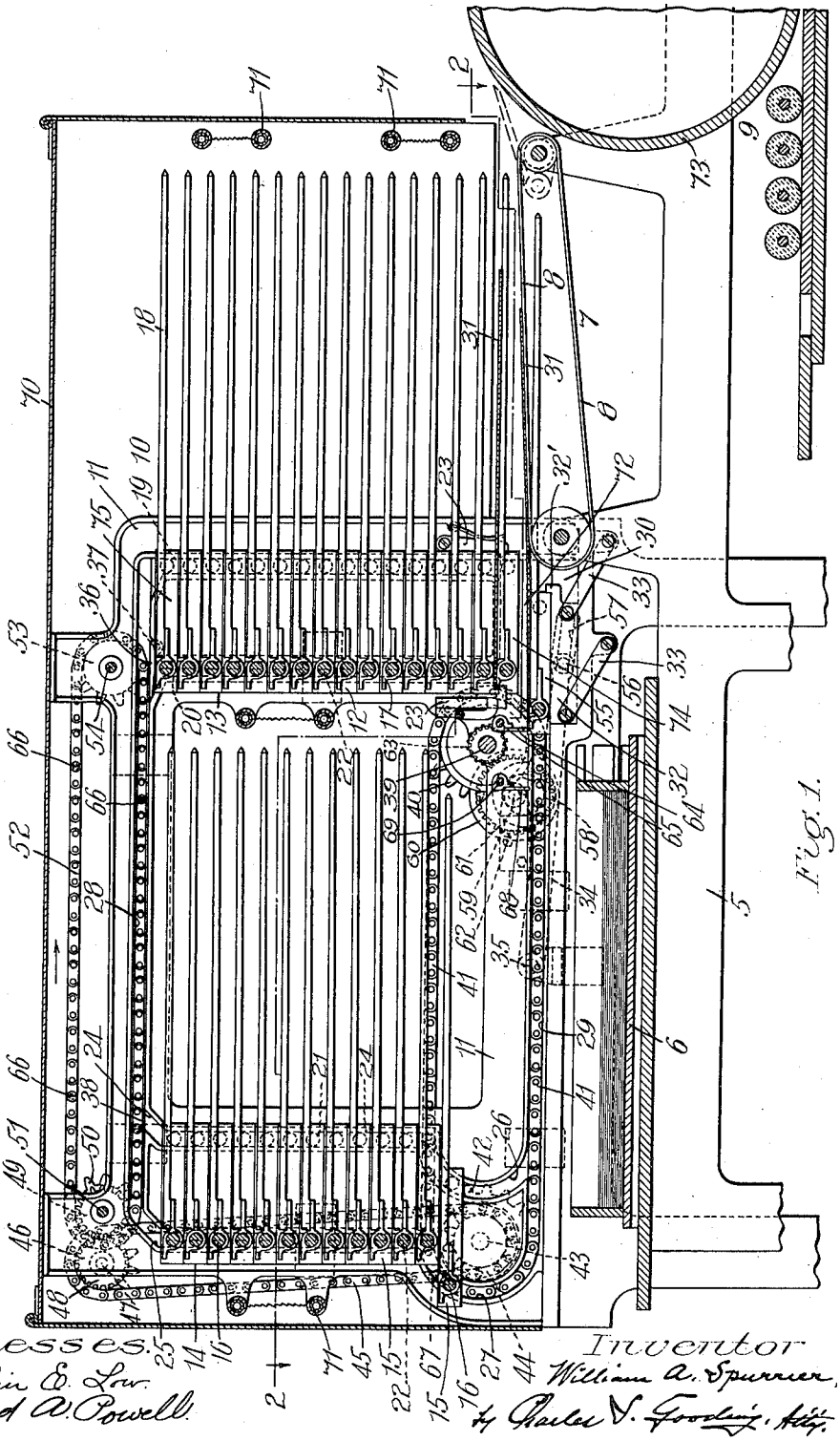

Fig. 1.

Witnesses.
Franklin E. Low.
Leonard A. Powell.

Inventor
William A. Spurrier,
by Parker N. Gooding, Atty.

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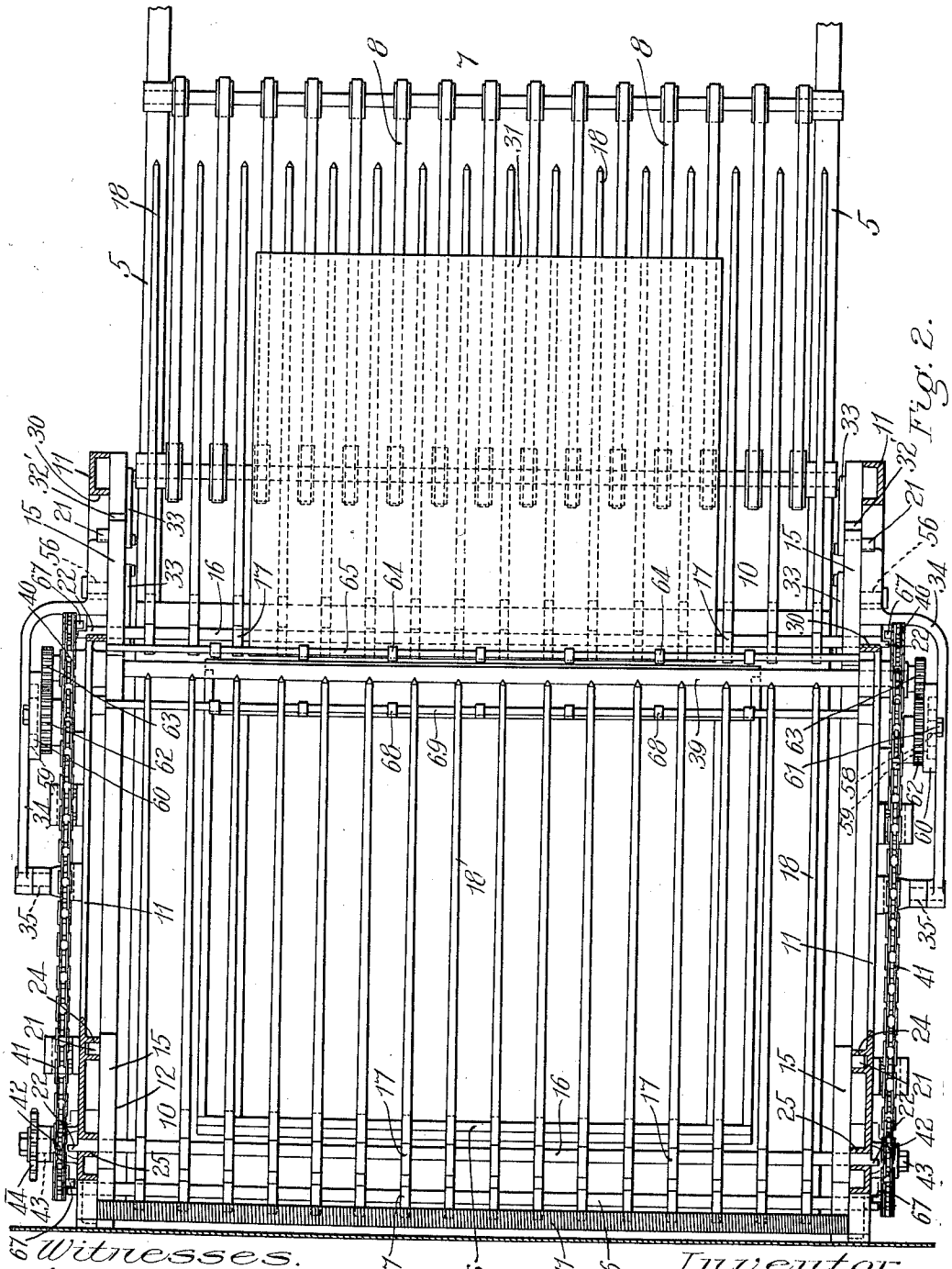

Fig. 2.

Witnesses.
Franklin E. Low
Leonard A. Powell

Inventor:
William A. Spurrier.
by Charles D. Goodwin. Atty.

UNITED STATES PATENT OFFICE.

WILLIAM A. SPURRIER, OF NEWTON, MASSACHUSETTS.

DRYING APPARATUS FOR PRINTED SHEETS OF PAPER.

1,037,075. Specification of Letters Patent. Patented Aug. 27, 1912.

Application filed October 18, 1911. Serial No. 655,369.

To all whom it may concern:

Be it known that I, WILLIAM A. SPURRIER, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Drying Apparatus for Printed Sheets of Paper, of which the following is a specification.

This invention relates to improvements in devices for facilitating the drying of freshly printed sheets of paper.

It is well known to those skilled in the art that the time required to actually dry the average printing ink is from six to twelve hours, but that if properly exposed to the air said sheets may be dried in a much shorter time sufficiently to allow the placing of the same, one upon the other without the ink thereon offsetting.

The object of the invention is to provide an apparatus which is adapted to receive the printed sheets of paper direct from the printing instrumentalities and hold said sheets in a substantially horizontal plane while conveying them slowly into and through a heated chamber where they are retained a sufficient length of time to permit the ink thereon to set or to dry, after which they are placed upon the delivery table of the press without disturbing the sequence of printing.

The object is still further to provide an apparatus for drying printed sheets of paper which is so constructed that it may be placed above the delivery table of a printing press structually independent therefrom and occupying but very little more floor space than is occupied by the ordinary delivery mechanism of said printing press, and furthermore, said apparatus may be moved from one press and used on another press without material change in the parts.

The invention consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof, but is not intended to be limited to the particular construction of elements hereinafter described as it might be embodied in other forms and devices differing from those hereinafter described by such variations therefrom as would necessitate merely the exercise of mechanical skill.

Like numerals refer to like parts in both views of the drawings.

Referring to the drawings: Figure 1 is a longitudinal sectional elevation of an apparatus embodying my invention. Fig. 2 is a sectional plan view of the same taken on the irregular line 2—2 of Fig. 1.

In the drawings, 5 is a portion of the frame of a printing press upon which a delivery table or sheet receiver 6 is placed. A paper carrier 7 consisting of endless belts 8, 8 is also mounted upon said frame 5 and is adapted to receive sheets of paper direct from the printing instrumentalities 9.

Located above and adjacent to the delivery table 6 and carrier 7 is a paper conveying device 10 mounted upon frames 11, 11 structurally independent from said printing press and embodying in its construction racks 12, 12 arranged in tiers 13 and 14. The racks 12 are provided at each end thereof with frames 15, 15 each of said frames adapted to engage and support another frame of like construction. The frames 15, 15 are connected together by a shaft 16 upon which are mounted a series of brackets 17, 17 having secured thereto sticks 18, 18 upon which the sheets of paper are held, sufficient space being provided between the sticks of one of said racks and the brackets of the adjacent rack to allow the sheets of paper 31 to rest upon said sticks without contacting with said brackets.

Grooves 19 and 20 are provided in each of the side frames 11, 11 thus constituting guides adjacent to the end frames 15, 15 of the tier of racks 13. Projections 21, 21 extend laterally from each of the frames 15 and project into the grooves 19, while the shaft 16 projects through the frame 15 forming the projections 22, 22 which engage the other of said grooves 20, 20, said projections 21 and 22 serving to guide said racks upwardly in a substantially horizontal position. Detents 23, 23 pivoted to the side frames 11, 11 engage the lowermost rack in said tier of racks, thereby supporting said tier and retaining the same within said grooves. Grooves 24 and 25 in the side frames 11, 11 also constituting guides, are provided adjacent to the frames 15, 15 of the tier of racks 14. The grooves 24 are engaged by the projections 21 of said racks and the grooves 25 are engaged by the projections 22, said grooves 24 and 25 serving to guide the racks downwardly or laterally relative to the sheets of paper carried there-

by and toward the delivery table 6. The grooves 24 and 25 terminate at their lower ends in semi-circular grooves 26 and 27 which check the downward movement of said racks. A groove 28 connects the upper ends of the grooves 19 and 20 with the upper ends of the grooves 24 and 25 and a groove 29 connects the lower ends of the semi-circular grooves 26 and 27 with a recess 30 to which the lower ends of the grooves 19 and 20 are connected. An elevator 32 is pivotally mounted within the recesses 30, 30 upon links 33, 33 at each end of said elevator and adapted to guide said elevator horizontally across a gap 72 between the end of the groove 29 and the lower end of the grooves 19 and 20, said gap being provided for the purpose of allowing more space in which to feed the sheets of paper onto said racks. A suitable mechanism is provided, as hereinafter described, to circulate the racks 13 upwardly along the grooves 21 and 22, thence horizontally along the groove 28, which is substantially parallel with the sheets of paper carried by said racks, thence downwardly along the grooves 24 and 25, grooves 26 and 27, and horizontal groove 29 to the elevator 32, and from thence upwardly into said grooves 19 and 20.

To prevent the projections 21 from dropping into the grooves 20 while the racks 13 are being moved along the groove 28, switches 36 are pivoted at 37 to the side frames 11 and swing upwardly allowing the free passage of the projections 22, 22 upwardly and out of the grooves 20, but immediately dropping back into place in time to bridge said grooves to guide said projections 21, 21 thereacross. To prevent the projections 22, 22 from dropping into the grooves 24, said projections are extended beyond the projections 21, thus requiring the grooves 20, 28, 25, 27 and 29 to be cut deeper than the grooves 19 and 24 and causing a ledge 38 to be formed at the upper end of the groove 24, said ledge guiding said projections 22 past the entrance of said grooves.

I preferably employ a coöperative actuating mechanism to circulate said racks along the hereinbefore described grooves, said mechanism embodying in its construction a shaft 39 to which a rotary motion is imparted by any suitable means capable of imparting thereto a speed which shall circulate said racks and present the same one at a time to the delivering means of the device from which the sheets of material are to be received synchronously with the delivery of said sheets of material which are also fed one at a time to said delivering means. Sprockets 40, 40 secured on said shafts are connected through chains 41, 41 to sprockets 42, 42 rotatably mounted upon studs 43, 43 secured in the said frames 11, 11. A sprocket 44 is secured to one of the sprockets 42 and is connected by a chain 45 to a sprocket 46 rotatably mounted upon a stud 47. A gear 48 is mounted to rotate in unison with the sprocket 46 upon the stud 47 and engages another gear 49 which, with a sprocket 50, is secured upon a shaft 51 journaled to rotate in said frame. Said sprocket 50 is connected by a chain 52 to a sprocket 53 on the shaft 54, said shaft being journaled to rotate in said frame. A rack 55 having previously been guided along the grooves 29, 29 to the elevator 32 and into the position against a stop 32′, is arranged to receive a sheet of paper 31 which is fed from the printing instrumentalities 9 by the endless belts 8, 8 of the carrier 7 and along the sticks 18 of said racks, to the stops 64, 64 mounted upon the rod 65.

A rocking movement is imparted to the elevator 32 by the cam levers 34 engaging studs 56, 56 at each end, respectively, of said elevator, said studs working in slots 57, 57 in said levers. Cam rolls 58 upon the levers 34 engage cam grooves 59 in the cams 60 which are rotated upon the studs 61, 61 by gears 62 secured to said cams, respectively, and which, in turn, are rotated by pinions 63, 63, respectively, fast to the shaft 39.

As the tier of racks 13 is moved upwardly or laterally relatively to the sheets of paper carried thereby, the projections 22, 22 upon the upper rack are moved into the path of pins 66, 66 by which said rack is transferred from the tier 13 along the grooves 28 to the tier 14, while the lowermost rack in the tier 14 is engaged by pins 67, 67 which move said rack along the grooves 26 and 27 and into and through the groove 29 to the elevator 32 and against the stop 32′, and while passing along said grooves 29 the paper thereon is transferred therefrom to the table 6 by fingers 68, 68 secured upon a rod 69, said fingers projecting downwardly between the sticks 18 of said rack. As the lowermost rack in said tier 14 is removed therefrom, the remaining racks are allowed to move downwardly toward said delivery table until the next succeeding rack engages the lower curved edges of the grooves 26 and 27 where it remains until removed by the studs 67 on the chain 41.

To facilitate the drying of the ink on the sheets 31, a casing 70 is mounted upon the frames 11, 11 and incloses the top and sides of said paper conveying device and heating devices 71, 71 are provided which heat the air within said chamber through which said sheets of paper are conveyed.

The general operation of the device is as follows: The sheets of paper are fed from the impression cylinder 73 of the printing instrumentalities by the endless belts, 8, 8 into the gap 72 against the stops 64 and upon the rack 55, while said rack rests upon

the elevator 32. As the cams 60 are rotated, the levers 34 are rocked upon their pivots 35, 35 to move the elevator upwardly, thus transferring the rack 55 from its position shown in Fig. 1 to the position occupied by the lowermost rack 74 in the tier of racks 13, in which postion it is held by the detents 23, 23. As the rack 55 enters the grooves 19 and 20, the tier of racks therein are moved upwardlv the space occupied by one rack, and the uppermost rack 75 in said tier of racks is carried into engagement with the pins 66 upon the chain 52, whereby said rack is transferred from the tier 13 along the groove 28 to the top of the tier 14. Simultaneously with the movement of the rack 75, the lowermost rack in the tier of racks 14 is transferred from said lowermost position by pins 67, 67 upon the chains 41 through the grooves 26 and 27 into the grooves 29 and along said grooves to the stops 68, 68 which check the movement of the sheet thereon and thereby transfers the sheet from said rack to the delivery table 6. Said rack is then moved along said grooves 29 to the elevator 32 and into position to receive another sheet of paper, and so on, circulating intermittently upward into the heated chamber in the casing 70 and being retained therein a sufficient length of time to allow the heat to permeate said sheets and dry the ink thereon. The rack is then moved downwardly to deliver the sheet to the delivery table in its proper sequence, and is then moved back to the receiving position.

Having thus described my invention what I claim and desire by Letters Patent to secure is:

1. A drying apparatus for printed sheets of paper having, in combination, a rack adapted to hold a sheet of paper, mechanism capable of moving said rack in a direction laterally of the plane of the sheet of paper carried thereby, and mechanism adapted to move said rack substantially in the plane of said sheet of paper.

2. A drying apparatus for printed sheets of paper having, in combination, a rack adapted to hold a sheet of paper, mechanism capable of moving said rack in a direction laterally of the plane of the sheet of paper carried thereby, mechanism adapted to move said rack substantially in the plane of said sheet of paper and means to automatically remove the sheet of paper from said rack.

3. A drying apparatus for printed sheets of paper having, in combination, a rack adapted to hold a sheet of paper in a substantially horizontal position, mechanism capable of moving said rack in a direction laterally of the plane of the sheet of paper carried thereby, mechanism adapted to move said rack substantially in the plane of said sheet of paper and means to remove the sheet of paper from said rack.

4. A drying apparatus for printed sheets of paper having, in combination, a delivery table, a carrier, a series of racks each adapted to receive a sheet of paper from said carrier, mechanism capable of moving each of said racks in a direction laterally of the plane of the sheet of paper carried thereby, mechanism for moving said racks substantially in the plane of said sheets of paper, and means to transfer said sheets of paper from said racks to said delivery table.

5. A drying apparatus for printed sheets of paper having, in combination, a casing, means for heating the air in said casing, a series of racks each adapted to hold a sheet of paper, coöperative actuating means capable of moving said racks in said casing in a direction laterally of the plane of the sheets of paper carried by said racks, and in the plane of said sheets of paper, and means to remove the sheet from each of said racks.

6. A drying apparatus for printed sheets of paper having, in combination, a delivery table, a paper conveying device mounted above and adjacent to said delivery table and embodying in its construction a series of racks, each adapted to receive and hold a sheet of paper at an angle less than 45 degrees to a horizontal plane, coöperative actuating means capable of moving said racks in a direction laterally of and substantially in the plane of the sheets of paper carried thereby and means to automatically transfer the sheets of paper from said racks successively to said delivery table.

7. A drying apparatus for printed sheets of paper having, in combination, a delivery table, a paper conveying device mounted above and adjacent to said delivery table, but structurally independent therefrom, and embodying in its construction a series of racks, each adapted to receive and hold a sheet of paper at an angle less than 45 degrees to a horizontal plane, coöperative actuating means capable of moving said racks laterally of and substantially parallel with the sheets of paper carried thereby and means to transfer the sheets of paper from said racks to said delivery table.

8. A drying apparatus for printed sheets of paper having, in combination, a series of racks arranged in two tiers, each of said racks adapted to hold a sheet of paper, cooperative actuating means adapted to transfer said racks one at a time from one to the other of said tiers, and means for removing the sheets of paper from said racks.

9. A drying apparatus for printed sheets of paper having, in combination, a series of racks arranged in two tiers, each of said racks adapted to hold a sheet of paper cooperative actuating means adapted to transfer said racks, one at a time from the top of one of said tiers to the top of the other of said tiers and from the bottom of said

last mentioned tier to the bottom of said first mentioned tier and means for removing the sheets of paper from said racks.

10. A drying apparatus for printed sheets of paper having, in combination, a delivery table, a carrier, a plurality of racks each adapted to hold a sheet of paper, said racks being arranged in two tiers with one of said tiers adjacent to said carrier, and the other of said tiers adjacent to said delivery table, means to guide the first mentioned tier of racks away from said carrier, means to guide the second mentioned tier of racks toward said delivery table, mechanism adapted to transfer a rack from one end of the first mentioned tier of racks to one end of the second mentioned tier of racks, mechanism adapted to transfer a rack from the opposite end of said second mentioned tier to the opposite end of said first mentioned tier, and means to transfer said sheets of paper from said racks to said delivery table.

11. A drying apparatus for printed sheets of paper having, in combination, a carrier for sheets of paper, a plurality of racks arranged in two tiers each of said racks adapted to hold a sheet of paper, mechanism adapted to transfer said racks one at a time from the end of one of said tiers to the end of the other of said tiers, mechanism for moving a rack from the opposite end of said second mentioned tier into a position to receive a sheet of paper from said carrier, means to remove a sheet of paper from each of said racks respectively during said movement and mechanism adapted to move said rack from said receiving position to the receiving end of the first mentioned tier of racks.

12. A drying apparatus for printed sheets of paper having, in combination, a carrier for sheets of paper, a plurality of racks arranged in two upwardly extending tiers, guides for each of said tiers, mechanism adapted to transfer said racks one at a time from the upper end of one to the upper end of the other of said tiers, mechanism for moving one of said racks at a time from the lower end of the second mentioned tier of racks into a position to receive a sheet of paper for said carrier, means to remove a sheet of paper from said rack during said movement, an elevator and means to actuate said elevator to transfer said rack from said receiving position to the position occupied by the lowermost rack in the first mentioned tier of racks whereby the racks in said tier are advanced along said guides.

13. A drying apparatus for printed sheets of paper having, in combination, a carrier for sheets of paper, a plurality of racks arranged in two upwardly extending tiers, guides for each of said tiers, mechanism adapted to transfer said racks one at a time from the upper end of one to the upper end of the other of said tiers, mechanism for moving one of said racks at a time from the lower end of the second mentioned tier of racks into a position to receive a sheet of paper from said carrier, means to automatically remove a sheet of paper from said rack during said movement, an elevator, means to actuate said elevator to transfer said rack from said receiving position to the position occupied by the lowermost rack in the first mentioned tier of racks whereby the racks in said tier are advanced along said guides and means to retain said lowermost rack in position at the bottom of said tier of racks.

14. A drying apparatus for printed sheets of paper having, in combination, a plurality of racks each adapted to hold a sheet of paper, said racks being arranged in upwardly extending tiers, guides adjacent to the opposite ends of said racks adapted to guide the racks in one of said tiers upwardly and in the other of said tiers downwardly and retain the sheets on each of said racks in a substantially horizontal plane, guides connecting the upper ends and lower ends respectively of the upwardly extending guides of each of said tiers and substantially parallel to the sheets of paper carried by said racks, and coöperative actuating means adapted to advance said racks along said guides.

15. A drying apparatus for printed sheets of paper having, in combination, a plurality of racks each adapted to hold a sheet of paper, said racks being arranged in upwardly extending tiers, vertically disposed guides adjacent to the opposite ends of said racks adapted to guide the racks in one of said tiers upwardly and in the other of said tiers downwardly and retain the sheets on each of said racks in a substantially horizontal plane, guides connecting the upper ends and lower ends respectively of the upwardly extending guides of each of said tiers and substantially parallel to the sheets of paper carried by said racks, and coöperative actuating means adapted to intermittently advance said racks along said guides.

16. A drying apparatus for printed sheets of paper having, in combination, a casing, means for heating the air in said casing, a rack adapted to hold a sheet of paper, mechanism capable of moving said rack in said casing in a direction laterally of the plane of the sheet of paper carried by said rack, and mechanism adapted to move said rack in said casing in the plane of said sheet of paper.

17. A drying apparatus for printed sheets of paper having, in combination, a plurality of racks each adapted to hold a sheet of

paper, said racks being arranged in upwardly extending tiers, a plurality of upwardly extending guides adjacent to the opposite ends of the racks forming said tiers, guides connecting the upper ends and lower ends, respectively, of said upwardly extending guides, means adapted to coöperate with said guides to retain the paper carried by said racks in a substantially horizontal position while said racks are being moved along said guides, and mechanism to move said racks along said guides.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM A. SPURRIER.

Witnesses:
CHARLES S. GOODING,
SYDNEY E. TAFT.