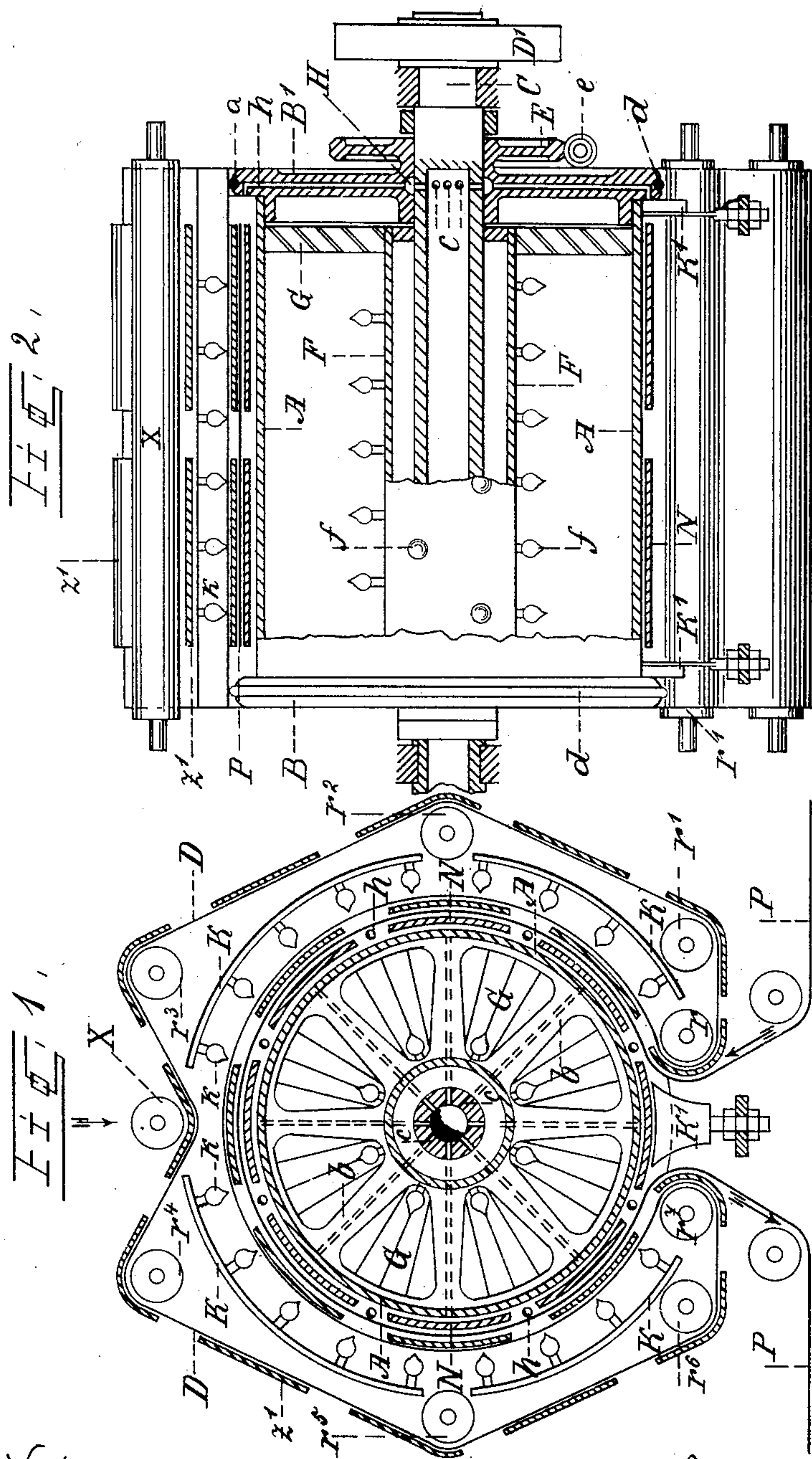


(No Model.)

A. SCHWARZ.
PHOTOGRAPHIC PRINTING APPARATUS.

No. 601,883.

Patented Apr. 5, 1898.



Witnesses.
J. C. Lebert.
O. Block

Inventor.
Arthur Schwarz,
By H. A. de Vos.
Attorney.—

UNITED STATES PATENT OFFICE.

ARTHUR SCHWARZ, OF BERLIN, GERMANY.

PHOTOGRAPHIC-PRINTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 601,883, dated April 5, 1898.

Application filed May 7, 1897. Serial No. 635,503. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR SCHWARZ, a subject of the German Emperor, residing at Berlin-Schöneberg, Germany, have invented certain new and useful Improvements in Rotary Pneumatic Copying Apparatus for Photographs, of which the following is a specification.

My invention relates to a pneumatic copying apparatus for photographs in large quantities, especially adapted for the exposure of the comparatively cheap albumin-paper. This paper requires a long exposure compared to the other sensitized papers used for photographs.

I have illustrated my new apparatus in the annexed drawings, making a part of this specification, and wherein—

Figure 1 shows a transverse central section, and Fig. 2 a longitudinal central section, of the improved copying apparatus.

The cylinder A, which, when Roentgen rays are being used, is made of opaque material, (metal, however, being excluded,) is provided at both ends with the disks B B', formed as pulleys, that are idle on the shaft C, which derives its rotary motion from the pulley D'. On the hub of the plate B' is mounted the worm-gear E, which is acted upon by the endless screw e and rotated in a direction opposite to that of the pulley D'. Consequently the cylinder A and the shaft C rotate in opposite directions, and as said shaft C carries within the cylinder a drum F, upon which electric lamps f are arranged, while, furthermore, said shaft can revolve at any desired velocity, whereas the cylinder A revolves slowly in the opposite direction, it is obvious that a thoroughly uniform illumination of the whole cylinder is obtained. By means of the great velocity of the shaft C, I further obtain a very effective ventilation and cooling of the highly-heated interior of the cylinder. This ventilation of the interior of the cylinder A is advantageously obtained by means of fans G G, mounted on the shaft C within the cylinder. To this end the disks B and B' are not solid, but are provided with spokes b, (see Fig. 1,) and the oblique fans are located between these spokes. I thus obtain a very effective ventilation within the cylinder A.

The negatives N are placed upon the sur-

face of the cylinder A, and the endless paper P travels around same in the direction of the arrows, reaching the cylinder after passing over a roll r and leaving the same at roll r', as shown in Fig. 1. From roll r' the paper is fed for further treatment through the several baths. Consequently the strip of paper P is exposed during its entire travel around the cylinder A—i. e., long enough to enable me to use albumin-paper, and thus materially to decrease the price of the pictures; but if the use of cheap paper for the wholesale production of pictures is of great importance the close pressure of the paper upon the negatives is still more important, as only in this way good copies can be obtained. This result is obtained by a pneumatic arrangement of my invention, which I will now proceed to describe.

The pressure-blanket D, made of rubber or any other suitable air-tight material, passes over roll r upon the cylinder, and after circulating around the same it passes off over roll r' and returns toward roll r over the guide-rolls r', r², r³, r⁴, r⁵, and r⁶. The blanket thus forms an endless circulating band, which may be firmly tightened about the cylinder by means of the adjustable roll X; but this tension is not sufficient for the production of sharp clear copies, and the requisite uniform adjustment of the blanket is so far only obtained by means of pneumatic pressure. To employ such pressure in the present instance, it is necessary that the blanket should adjust itself air-tight to the cylinder A. This purpose is attained by providing the edges of the blanket with a padded rim d, guided in a corresponding groove arranged in the circumference of the disks B B'. As shown in Fig. 2, these disks are larger in diameter than the cylinder, so that a cavity is formed at the point where the blanket passes from the cylinder to the disks. Air-ducts h, running through the hollow spokes of the disks B B', end in this cavity, so that these disks looked at from the inside, Fig. 1, present a series of holes h, distributed around the cylinder A. All the ducts h of each disk end at their other ends in a groove H, provided in the hub of the disk, said groove surrounding a series of apertures c, made in the hollow shaft C, so that when the air is exhausted from this hol-

low shaft a vacuum is also formed under the blanket D, the air flowing off through the ducts *h*, the groove H, and the apertures *c*. One end of the shaft C is of course closed air-tight—for instance, near the pulley D'—while the other end is connected with the air-suction pipe, so that the shaft can rotate freely.

As already stated, the blanket D comes into contact with the cylinder A near the roll *r* and leaves same near roll *r*⁷. Between these two points remains a space not covered by the blanket, and as the cylinder rotates all the openings *h* are bound to pass this open space. Consequently during these successive passages the air-suction pipe would connect with the free air, which would render the formation of a vacuum under the blanket very difficult, if not altogether impossible. I have overcome this difficulty by arranging between the rolls *r* and *r*⁷ a spring-actuated guard K', which, as shown in Fig. 2, adjusts itself tightly against the inner side of the edge of the disks B B', reaching beyond the surface of the cylinder A, and thus closes the duct-openings *h* immediately when they are no longer covered by the blanket D. In Fig. 1 the closely-adjusting parts are shown at comparatively great distances from each other. This was done in order to clearly show the several thin layers. Consequently only a slight activity of the air-pump will be required, for theoretically the vacuum under the blanket will be continuously maintained, but in the practice small leaks cannot be entirely avoided.

As the cylinder A rotates with the blanket and in the same direction and the blanket is continually pulled off the cylinder near the roll *r*⁷ in very narrow strips, the travel of the blanket around the cylinder is effected without any difficulty, notwithstanding the great pressure exerted thereon.

The electrical current for the lamps in the cylinder can be made in any preferred manner—for instance, by a sliding contact with the rotary shaft C.

If instead of electric lamps X-rays are used for the exposure, suitable vacuum-tubes or other similar devices are substituted for the lamps. In this case it is not necessary that the cylinder be made of transparent material.

If it is desired to use paper sensitized on both sides in the apparatus described, I employ, instead of the usual opaque blanket, a blanket made of translucent material—for instance, celluloid. In this case the second series of negatives N is distributed over the whole surface of the transparent or translucent blanket turned toward the cylinder A, as shown in Fig. 1.

In the space between the part of the blanket covering the sensitized paper and that running over the rolls *r* *r*⁷, which space is open at the sides, are placed supports K for the electric lamps.

The operation of this double copying ap-

paratus is obvious, and is more specifically described in my application filed March 29, 1897, Serial No. 629,796.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary pneumatic copying apparatus the combination of a rotary cylinder with a pressure-blanket traveling with said cylinder and means for forming a vacuum between the cylinder and the blanket, substantially as and for the purpose described and set forth.

2. In a rotary pneumatic copying apparatus the combination of a rotary cylinder with disks equipped with air-ducts, said air-ducts connecting the space between the surface of the cylinder and the pressure-blanket with the hollow axle upon which the cylinder is mounted, substantially as and for the purpose described and set forth.

3. In a rotary copying apparatus the combination of a rotary cylinder with a pressure-blanket circulating around and covering nearly the entire surface of the cylinder, air-openings for the evacuation of the air between the cylinder and the blanket and a sliding spring-actuated guard adapted to close the air-holes not covered by the blanket, substantially as and for the purpose described and set forth.

4. In a rotary copying apparatus the combination of a rotary cylinder provided with disks B B' and mounted upon a hollow shaft, air-holes provided in the shaft and ending in a circular groove in the hub of said disks, air-passages provided in the spokes of the disks and connecting the space between the cylinder and the pressure-blanket with the hollow shaft, substantially as and for the purpose described and set forth.

5. In a rotary copying apparatus, the combination of a rotary cylinder, and a shaft inside of said cylinder rotatable in the opposite direction to the cylinder and carrying a lighting medium for the exposure, substantially as and for the purposes described.

6. In a rotary copying apparatus, the combination of a rotary cylinder, and means for creating a circulation of air within the cylinder for ventilating and cooling the interior of the cylinder, substantially as and for the purposes described.

7. In a rotary copying apparatus, the combination with a rotary cylinder, of a shaft within the cylinder and rotatable at a different speed from the cylinder, and means connected to said shaft for creating an air-current within the cylinder for ventilating and cooling the interior of the cylinder, substantially as and for the purposes described.

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

ARTHUR SCHWARZ.

Witnesses:

W. HAUPT,

HENRY HARPER.