(No Model.) 4 Sheets—Sheet 1.

W. AINSWORTH, R. P. STRACHAN & G. HENSHAW.

APPARATUS FOR PRINTING PAPER BAGS IN CONNECTION WITH PAPER BAG MAKING MACHINERY.

No. 419,399. Patented Jan. 14, 1890.

Fig 4

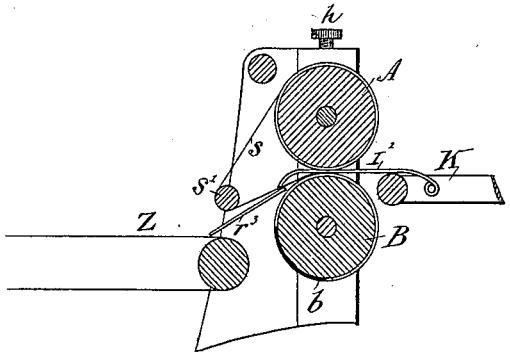
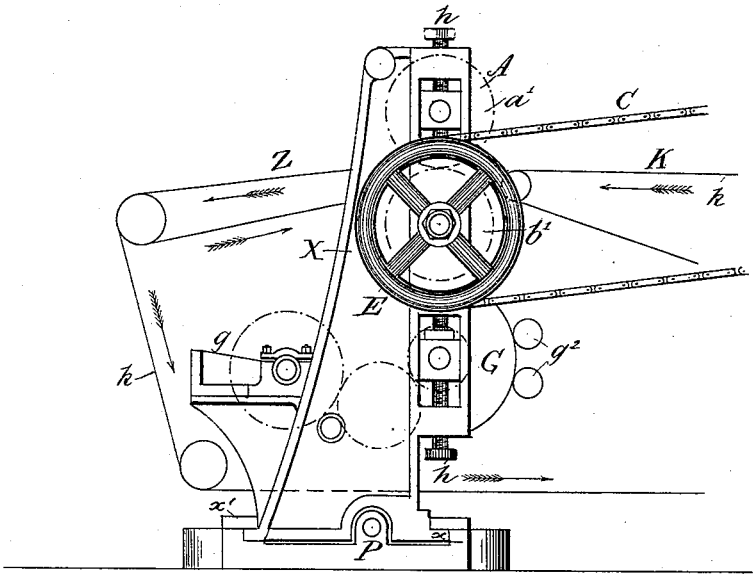


Fig 1



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(No Model.) 4 Sheets—Sheet 2.

W. AINSWORTH, R. P. STRACHAN & G. HENSHAW.

APPARATUS FOR PRINTING PAPER BAGS IN CONNECTION WITH PAPER BAG MAKING MACHINERY.

No. 419,399. Patented Jan. 14, 1890.

Fig 3.

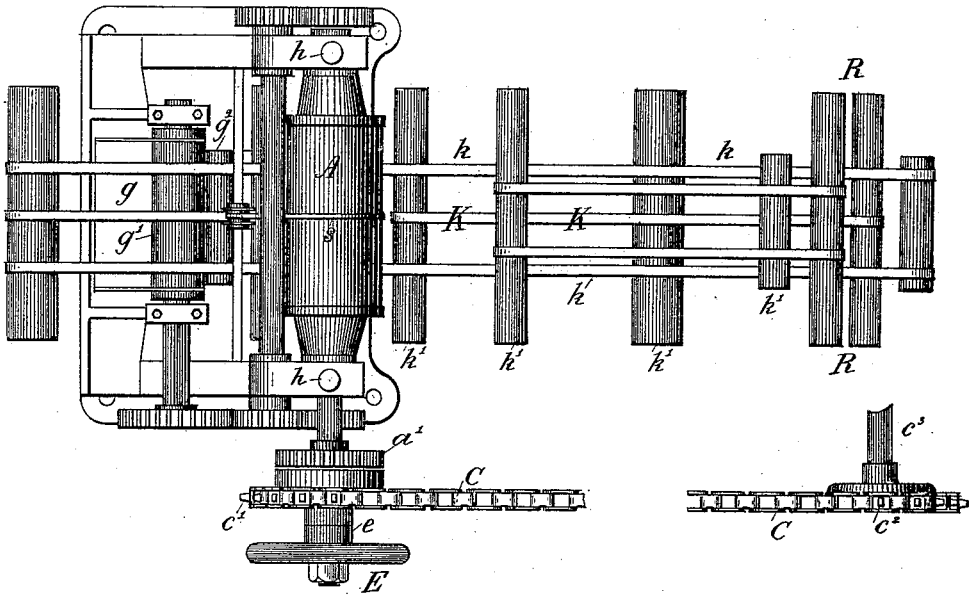
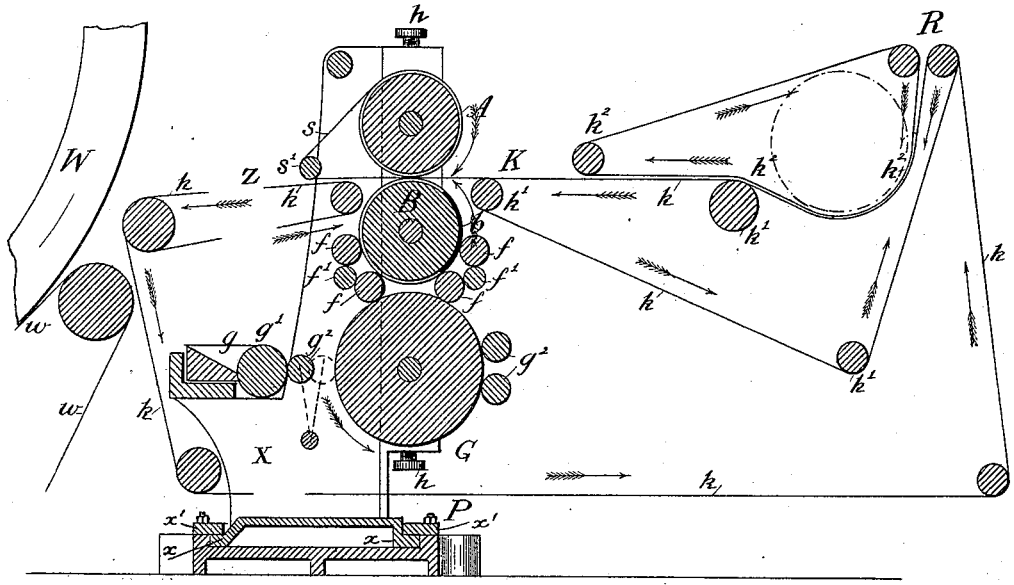


Fig 2.



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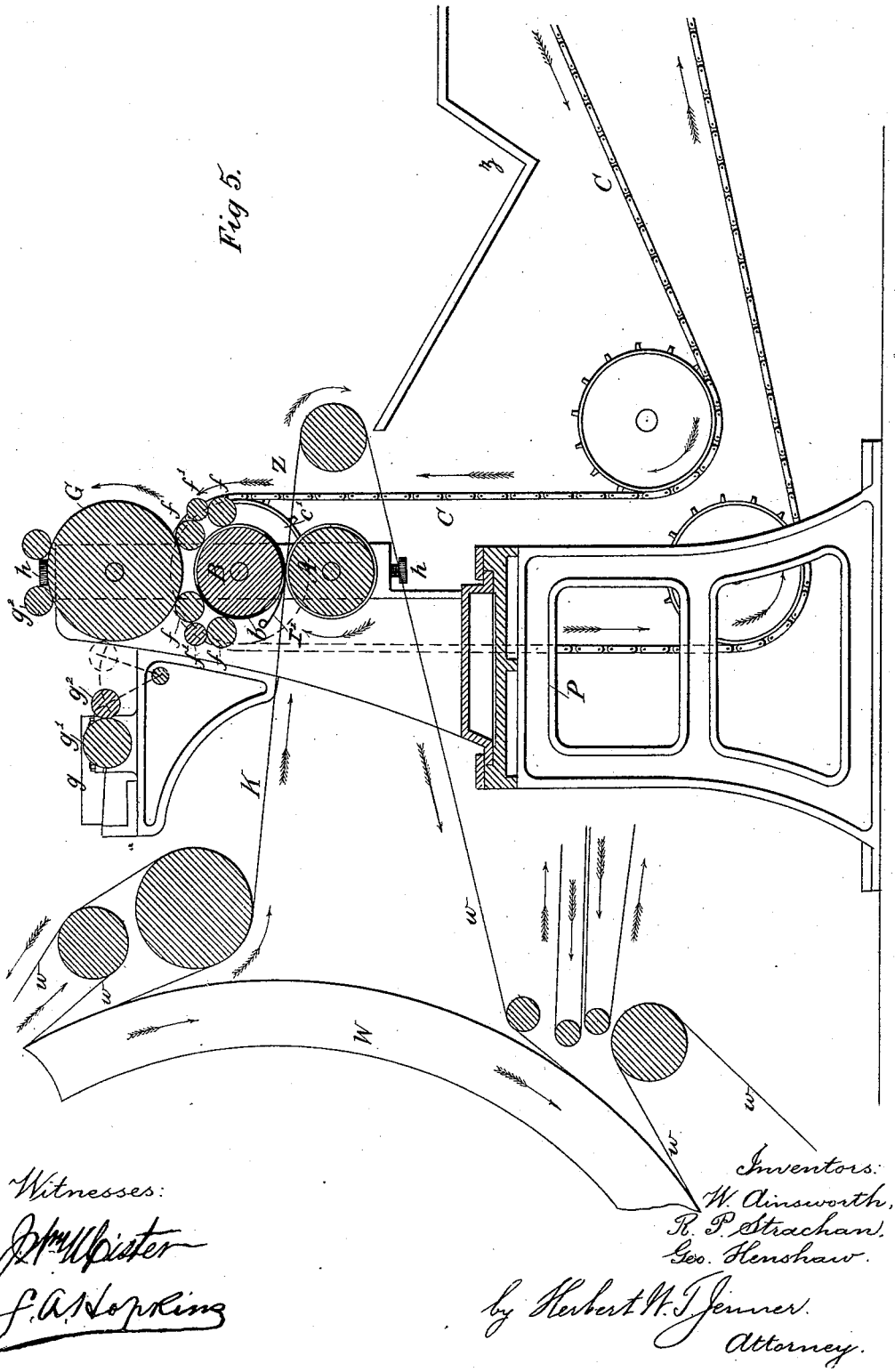
(No Model.) 4 Sheets—Sheet 3.

W. AINSWORTH, R. P. STRACHAN & G. HENSHAW.

APPARATUS FOR PRINTING PAPER BAGS IN CONNECTION WITH PAPER BAG MAKING MACHINERY.

No. 419,399. Patented Jan. 14, 1890.

Fig 5.



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(No Model.) 4 Sheets—Sheet 4.

W. AINSWORTH, R. P. STRACHAN & G. HENSHAW.

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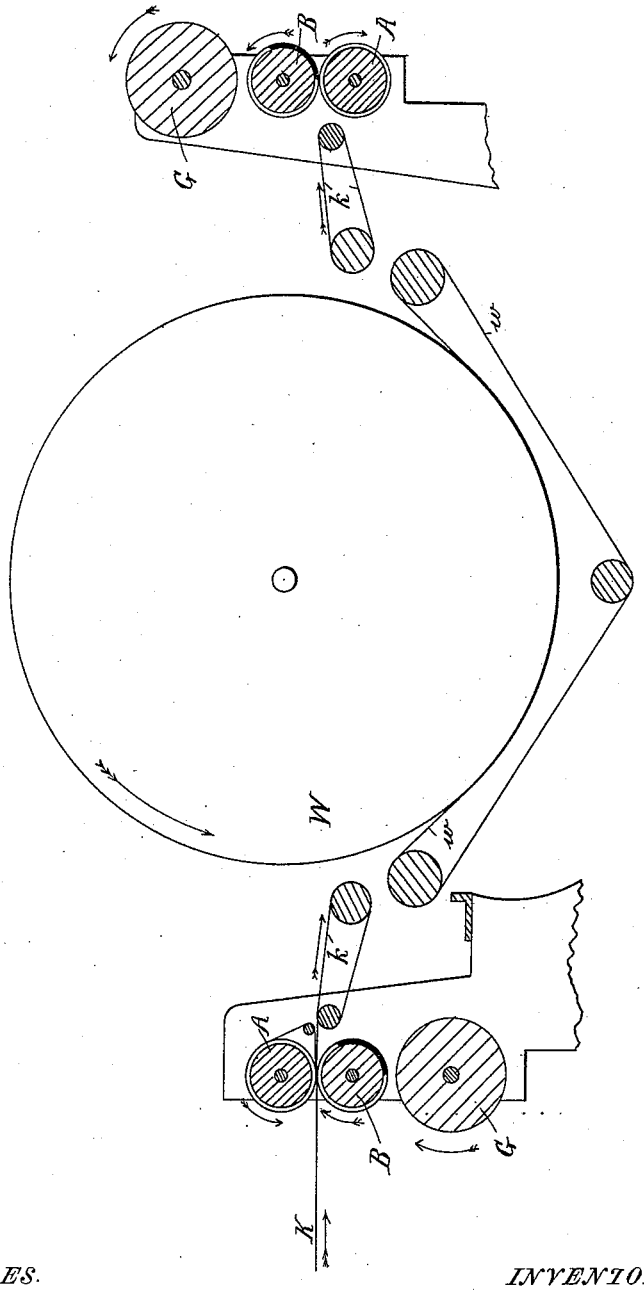

Fig. 6.

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Attorney

UNITED STATES PATENT OFFICE.

WILLIAM AINSWORTH, OF ACCRINGTON, COUNTY OF LANCASTER, AND ROBERT PRICE STRACHAN AND GEORGE HENSHAW, OF BRISTOL, COUNTY OF GLOUCESTER, ENGLAND.

APPARATUS FOR PRINTING PAPER BAGS IN CONNECTION WITH PAPER-BAG-MAKING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 419,399, dated January 14, 1890.

Application filed March 14, 1889. Serial No. 303,349. (No model.) Patented in England December 17, 1888, No. 18,392; in France February 4, 1889, No. 182,747; in Belgium February 4, 1889, No. 63,344, and in Germany February 4, 1889, No. 7,738.

To all whom it may concern:

Be it known that we, WILLIAM AINSWORTH, a subject of the Queen of Great Britain and Ireland, residing at 15 Perth Street, Accrington, in the county of Lancaster, England, and ROBERT PRICE STRACHAN and GEORGE HENSHAW, also subjects of the Queen of Great Britain and Ireland, residing at Long Row, Victoria Street, Bristol, in the county of Gloucester, England, have invented certain new and useful Improvements in Apparatus for Printing Paper Bags in Connection with Paper-Bag-Making Machinery; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Letters Patent have been granted for this invention as follows: Great Britain, No. 18,392, dated December 17, 1888; France, No. 182,747, dated February 4, 1889; Belgium, No. 63,344, dated February 4, 1889, and Germany, No. 7,738, dated February 4, 1889.

This invention relates to certain improvements in printing machine-made paper bags during or on completion of the processes of manufacture and either after or before drying them.

The improvements are applicable for use in connection with any kind of paper-bag-making machines, but more especially with "continuous-action" machines, particularly of those types known as "Spences," otherwise called the "Union," and "Satchel" machines, or oblong or square bottomed continuous-action machines or any of the various modifications thereof, or machines wherein bags are formed direct from a web of paper drawn continuously from a roll, then folded into a tube over a "former-plate," this tube being next cut into lengths to form bags, and the folding, pasting, and forming the bottom of the bags being all performed while the bag-blanks continue in actual motion.

Our invention has for its object to provide an efficient printing apparatus applicable to such bag-making machines which shall print every bag delivered from the machine whatever its dimensions may be, so that bags of any desired dimensions may be automatically manufactured, printed, and completed during and by a series of consecutive processes on one machine without manual assistance.

In the accompanying drawings, Figure 1 is a part side elevation, Fig. 2 is a longitudinal section, and Fig. 3 a plan, of our improved rotary printing apparatus and of so much of a continuous-action paper-bag-making machine and its usual drying-cylinder as is necessary to illustrate our invention as applied to printing bags before drying. Fig. 4 is a part section of an alternative detail. Fig. 5 is a side elevation, partly in section, showing the invention as applied to printing bags after drying. Fig. 6 is a longitudinal section showing the outline of a combination of parts adapted for printing the bags in two colors.

The printing apparatus consists of a rotary cylinder A, covered with blanket felt or other suitable material, and a rotary form-cylinder B, carrying the stereotype or other printing surface or surfaces *b*. These two cylinders A and B are called hereinafter the "printing-cylinders." Their length is determined by the width of the bags and the number of streams of bags any given machine can deliver, and their circumferential dimensions should equal or exceed one or more of the longest bags to be printed. The circumference may, when printing shorter bags, be divided, if desired, into equal portions, so long as the aggregate length of these shorter bags does not exceed the circumference of the cylinder B, the portion allotted to each bag being equal and accurately placed.

The printing-cylinders are rotated, so that (for one stream of bags) one printing-surface is truly timed to meet each bag that is delivered by the bag-making machine. If there is only one printing-surface on the cylinder B, one bag only is printed at each revolution, one only being made on the main machine. If there is more than one printing-surface on the cylinder B, one revolution thereof will serve to print a like number of bags, that same number of bags being delivered from the bag-making machine, a defined portion of one revolution serving to print one bag.

In other words, the same number of printing-surfaces are presented by the cylinders as there are bags delivered to them.

Since when printing two or more shorter bags the lengths to be printed do not fill the whole circumference of the cylinders, as is the case with one long bag, it is necessary that the surface speed of the printing-cylinders be greater than that of the feed of the short bags, in order that a gain of speed equal to the width of the intervening space may be made and accurate meeting of the printing-surface and bag may ensue. Our method of feeding allows of this and enables our "one-imprint-to-one-bag" principle to be employed over a large range of lengths of bags without changing the diameters of the cylinders; but the speed of driving or the proportions of the driving-gear must be changed to suit the work of the printing-cylinders.

Cylinder B is driven positively either by an endless pitch-chain C, passing round chain-wheels c' and c^2, the latter being mounted upon any convenient revolving shaft of the main machine (for instance, as marked c^3 in Fig. 3) and rotated by any suitable power, or the printing apparatus may be driven by any suitable moving part of the main machine by suitably-timed gear of any known description; or in some cases the printing apparatus may be driven by the prime mover and its motion transmitted to the main machine, according as may be most convenient.

The surface speed of the printing-cylinders may equal but should not be less than that at which the paper passes into the main machine, and may exceed it for small bags to any workable extent, the limit being about three or four times the speed of the paper.

The cylinders A and B are geared together to revolve synchronously by spur-wheels a' b' and arranged to make one complete or any integral part of one revolution (such as one-fourth, one-third, or one-half) for each bag made on the main machine, according as one or several whole bags are printed in consecutive order at each revolution. It is desirable that these cylinders should be adjustable with regard to the stream of bags passing between them for printing, so that the exact position of the imprint on the bags may be insured. For this purpose the driving-gear is made to be readily disconnected from the driven apparatus. By one arrangement the chain-wheel c', driving the cylinders, is fitted with a friction-clutch e, operated by a hand-wheel E, or a clamp or other equivalent means may be substituted for throwing the cylinders A and B in and out of gear with the bag-making machine at any time, so that they may be operated by a hand-wheel independently of the driving-power, and, the position of the type being thus adjusted as required, they may then be geared up and started without interfering with the adjustment of the main machine.

The curved stereotype-plates or other printing-surfaces b may be secured to the impression-cylinder B by catches sliding in longitudinal dovetail slots that admit of the printing-matter being set to any required position circumferentially or endwise along the cylinder. Ink is applied to the printing-surface in any usual manner, or it may be effected as follows: Inking-rollers $f\,f\,f$, with intermediate rider-rollers $f'\,f'\,f'$, are carried in suitable brackets secured to the side frames X. The bottom rollers f bear both on the ink-distributing drum G and against the printing-surface b. Runners are provided on the inking-rollers and corresponding runner-paths on the cylinder B, so that the inking-rollers are guided and ink only the printing-surfaces b. The ink-distributing drum G is fed from an ordinary ink-duct g by a vibrating roller g', the ink being distributed on the drum G by rollers g^2, which are vibrated endwise by a cam or other suitable means.

The distributing drum G is driven at the same surface speed as the printing-cylinders by gearing. For the purpose of obtaining the requisite pressure for printing, the cylinders A and B are made adjustable as to their distance apart by means of set-screws h h, and they may be slightly separated at will by a suitable hand motion to prevent the cylinders printing when rotating, (for instance, in case the formation of the bags is interrupted,) so as to avoid inking or soiling of cylinder A.

Damping-rollers may be added to the impression-cylinder if lithographic or zincographic processes are used in printing.

All rollers are mounted in suitable bearings in the side frames X or in brackets attached thereto and not shown in the drawings.

The printing apparatus may be mounted bodily on a bed-plate P, so as to be capable of sliding adjustment and fixture by screws or other means to enable the printing-surfaces to be adjusted endwise to the line of bags without impeding the process of manufacture. The side frames X are provided with feet x, which slide in lateral grooves in the stationary bed P, and x' are cover-plates secured to the bed by screws and nuts for clamping the said feet in the grooves after the position of the frames has been adjusted.

In a combined machine for printing bags after complete manufacture, but before delivering them to the usual drying-cylinder, we arrange our improved apparatus as follows: The bags are fed in regular order and line from the delivery-rollers or other part R R of the main bag-making machine onto a traveling feeding-surface K. This is formed, as illustrated, of endless bands or equivalents $k\,k$, extending to the printing-cylinders and supported and guided where necessary by rollers $k'\,k'$. The bands $k\,k$, forming the feeding-bed K, may be those that convey the bags to and from the main machine, and may be driven by that machine, or, if not used in

the main machine, may be driven by it or by the printing apparatus. The speed of travel of the feed-bed K will usually be that at which the bags come from the main machine; but it may be geared to run at the same speed as the printing-cylinders. The bags rest on the bands *k k* by their own weight, and are delivered successively in regular line and order to the printing-cylinders. In some cases auxiliary rollers or bands, as at k^2, may be placed just above the feeding-bed K, approaching nearly to the printing-cylinders. These, lightly engaging with the bags on bed K, supplement their weight and insure regularity of feed; but in any case such extra pressure or hold must be very light, so as not to interfere with the removal of the bags or cause liability to injury thereto when seized by the cylinders A and B, which travel, as stated, at a higher speed than the bed K. Some or all of the endless bands may pass round and return over the rollers *k'*, just in front of the printing-cylinders, or the outer bands may be passed between the printing-cylinders in the spaces left at the sides of the type by the absence of printing-surface, and these bands, being continued on the discharge side, serve to form a receiving-bed Z and return guided by conveniently-arranged rollers, as illustrated, the arrows indicating the direction of travel.

Instead of the endless bands *k k* we may substitute a series of small rollers closely contiguous and provided or not with auxiliary weighting arrangements.

The bags deposited on bed K are carried forward and seized between the printing-cylinders A and B. They then immediately assume the surface speed of the said cylinders, and hence the necessity for the light hold by or on the feeding-bed K, as described; otherwise they would be torn or injured.

For the purpose of stripping off the bags from the type-cylinder B in case of sticking we adopt the following arrangements: Each printing-surface *b* is raised above the general surface of the cylinder B, and is usually made narrower than the bag, so that the margins of the bags extend beyond the printing-surface. In the intervening spaces endless bands of suitable material are passed between the cylinders A and B and round adjacent guide rollers, and thus work beneath the bag margins. These strip the bags off as soon as printed and force them toward the receiving-bed Z. For the sake of distinctness these are not shown in the drawings; but for the same purpose we apply to the blanket-cylinder A one or more exactly similar bands *s* of india-rubber or other elastic soft or thin material that will not greatly affect the impression should they come upon it, and we employ a guide *s'*, as before, on the discharge side, the action of said bands being as above described.

We may employ, as an alternative means for freeing the bags, fixed strips I^2, Fig. 4, of thin metal or other suitable material passing between the cylinders and printing-surfaces in a similar manner to the margin-bands above described. The strips I^2 may be supported from either or both sides of the cylinders, or for the same purpose we employ a scraper—such as r^3, Fig. 4—approaching very closely to the surface of one or both cylinders for the whole or any portion of their length. A portion of the drying-cylinder W and its surrounding web *w* is shown.

The receiving-bed Z is arranged on the discharge side of the printing-cylinders to receive and forward the printed bags to the drying-cylinder. It may be formed wholly or in part, as above described, by continuing the bands *k k* of bed K, or by the web *w* of the drying-cylinder W, or by bands driven at the required speed from any convenient moving part. Auxiliary bands or rollers may be applied to guide the bags thereon; but the delivery of printed bags from the printing-cylinders is so free that the bags at once acquire the speed of the receiving-bed Z.

Fig. 5 show part of a combined machine in which our improvements are arranged to print bags after they are completely manufactured, dried, and delivered from the drying-cylinder W. In the figures the reference-letters are the same as in the previous description, and the arrows indicate the direction of motion of the parts. Here the printing-cylinders A and B are inverted, the cylinder B being driven by the chain C and chain-wheels c' c^2, arranged and guided as illustrated, the wheel c^2 being driven by the main machine. The bags on being freed from the drying-cylinder W by the scrapers, cords, or tapes, as usual, are deposited on the feeding-bed K and by it fed to the printing-cylinders, and thence discharged onto a receiving-bed Z or into a suitable receptacle *z*. In this arrangement it is essential, as in the former arrangement, that the gearing should be so timed that the motion of the cut-off apparatus of the bag-making machine and printing-cylinders shall occur at equidistant periods of time, and this may be readily effected by any known arrangement of toothed and changed wheels without departing from the principle and essential features above set forth.

In a combined machine for printing bags after discharge from the drying-cylinder described in reference to Fig. 5 it is advantageous to provide means for preventing waste of bags by their continued delivery to the printing apparatus when that apparatus is stopped. Such means may consist of any known arrangement of fast and loose driving-pulleys and an ordinary shifting-belt, whereby the combined apparatus may be stopped and started as a whole, or the main machine, the printer, or the drying-cylinder may be started or stopped separately, as required, by clutch-gear or otherwise; but such ordinary mechanical arrangements form no part of our present invention.

Our improved apparatus may be arranged in any convenient manner—that is to say, with the printing-cylinders inverted or disposed horizontally or in any suitable position in relation to the main machine and its drying-cylinder. In some positions it is advisable to apply on the feed side of the printing-cylinders one or more pairs of plain cylinders running at equal or very nearly equal surface speed to the printing-cylinders for the purpose of feeding and guiding bags from the traveling bed K, and in such case margin-bands may be led between these and the printing-cylinders for the same purpose, as set forth. Two or more sets of printing-cylinders may be provided, one set following the other, the impression-cylinders B B being arranged alternately above and below the streams of bags, so that both sides of the bags may be printed, and the inking appliances and printing-cylinders may also be arranged to print the bag in several colors. Where two or more sets are used, the covered cylinders A A may be fitted with a "set-off sheet" to prevent trouble from the previously-printed surfaces setting off their ink in the known manner.

One apparatus, arranged as first above described, may be used to print one side of the bags before they enter the drying-cylinder, and a second to again print them when discharged therefrom, the ink on the first side being thus dried.

What we claim as our invention, and desire to secure by Letters Patent, is--

1. The combination, with the stationary bed for the printing apparatus provided with lateral grooves, of the side frames provided with feet adapted to slide in said grooves, the printing-rollers journaled in said side frames, and the cover-plates for clamping the feet in said grooves, substantially as and for the purpose set forth.

2. The combination, with the stationary delivery apparatus of a bag-forming machine, of a laterally-adjustable bag-printing apparatus and clamps for securing said printing apparatus after its position has been adjusted, substantially as and for the purpose set forth.

3. The combination, with the delivery apparatus of a bag-forming machine, of two sets of printing-rollers, a drying-cylinder intermediate between the said two sets of rollers, and endless traversing bands for conveying the bags between the printing-rollers, whereby the bags are first printed in one color, then dried, and finally printed in another color, substantially as set forth.

4. The combination, with the delivery apparatus of a bag-forming machine, of the printing-rollers driven at greater speed than said delivery apparatus, a traveling feeding-bed for conducting the bags from the delivery apparatus to the printing-rollers, and an auxiliary traveling surface above said traveling bed and adapted to press very lightly upon the bags, substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in the presence of two witnesses.

WILLIAM AINSWORTH.
ROBERT PRICE STRACHAN.
GEORGE HENSHAW.

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