

AMERICAN INDUSTRIES.—No. 50.  
THE WALL PAPER MANUFACTURE.

Among the many ways in which modern household decoration has been developed, perhaps no one occupies a more prominent position than the use of ready-made paper, instead of paint or tapestry, to cover the walls. And this method has become popular because of the degree of excellence which has been attained by manufacturers of wall paper within the memory of the present generation, the work now done being such as is sought after in the adornment of the most luxurious mansions in the world, while there is a great deal, also, the cost of which is so low that the lowest paid mechanic can afford to frequently brighten and freshen the walls of his living apartment therewith. A considerable manufacturing industry has, consequently, been developed for furnishing this one product, which affords no inconsiderable market for the paper manufacturer, and the dealers in colors, gums, and varnishes, besides giving employment to a large number of operatives. The illustrations on our first page this week give views of some of the leading operations in the conduct of this department of manufacture, as carried on by one of the leading houses in that line, Messrs. Christy, Shepherd & Garrett, at their large factory in West Twenty-third street, New York city.

Those who are in any way familiar with the art of printing will probably suppose that there is, from the start, some similarity between the processes of making letter-press work and the methods employed in producing the many figured patterns which we find in wall paper. One does suggest the other throughout, but the means used and the mechanical part of the work are as different as the products. Wall papers are printed in water colors almost exclusively; very heavy pigments are used and stout bodies made, which require a great deal of time to dry, and these conditions also modify the character and substance of the type or blocks from which impressions are to be taken as well as the manner of taking them.

The "color mixing," an illustration of the department for which may be seen to the left hand at the bottom of the page, is one of the most important, as well as one of the most difficult branches of the business, where an extensive variety of fine wall paper is to be made. Besides the large room here shown for this purpose the firm have a special chemical department in an adjoining building at the rear, where they manufacture some of their own colors. In the mixing room, however, there may be found nearly every variety of earthy coloring matters, such as raw and burnt umber, sienna, etc., besides a good collection of mineral and vegetable colors, with an extensive assortment of gums and varnishes and the different kinds of clay which form the staple for making the body and carrying the color in every description of wall paper printing. The clay used comes principally from South Carolina and New Jersey. Both kinds are very nearly white, and readily divide into a fine powder, but the New Jersey clay has sufficient alum to render it best fitted for the second grounding in preparing the paper for "satining" or glossing. A large building in the rear is used for storing the clay, and a railway runs thence under the floor of the mixing room, 500 tons a year being about the amount of clay used here. The mixing of the colors is effected in large circular vats, in which arms operated from a shaft overhead are kept constantly revolving. From these vats the color is drawn off as wanted and transferred by a railway which runs through the room to an elevator leading to the various printing departments on the floors above.

On the basement floor, where the color mixing is carried on, is also the room for the reception of printing paper, which comes in rolls weighing about one hundred pounds each, and of just the regular width for wall paper, except such as is required for window shades, which is as much wider as may be desired.

The first part of the printing process, represented in one of the views at the top of the page, is the "grounding," or the covering of the whole white surface of one side of the paper with the ground color, on which the future patterns are to be printed. In this operation the color is put on the paper by brushes. Two wooden cylinders are arranged a short distance apart, carrying a wide belt of thick woolen cloth, the lower cylinder turning slowly in a trough containing the color, while a brush, operating against the cloth on the upper cylinder, transfers the color therefrom to the paper. The lower cylinder has a knife or rule pressing against the cloth as it comes out of the color, so that the quantity taken up may be regulated as desired. The brush which puts the color on has a slight, quick motion across the paper running through. The paper afterwards goes under brushes running lengthwise of the paper, and then again crosswise. This operation distributes the color evenly and leaves a good finish, varying slightly according to the work being done.

For all satin finished or glossed papers a second grounding is necessary. The first grounding, to adhere properly to the paper, requires an amount of glue which would render it too brittle to take a good polish, so a second coat is given, which carries a good deal more fine clay in a solution especially prepared to give a high polish. This operation is effected in a department not shown in our illustrations. It is done entirely on brushing machines, which work very rapidly, a cylinder about two feet in diameter revolving against smaller cylinders on its circumference, and the paper passing over one and under another until each portion of its surface has been vigorously brushed under six or eight cylinders.

All of the above work is preliminary to the printing

proper, which is shown in the large view in the center of the page. For this purpose there are several large and small machines, the largest standing about fourteen feet high, and fitted to print twelve colors, but all working on the same principle. Each of these machines has a large drum in the middle, around which passes the paper, and, set at exactly the proper distances around its under side, are small rollers on which are the designs to be printed, each different color or shade being represented by a separate roller. It would hardly be proper to call these rollers or drums impression cylinders, in the sense in which printers use that term, for they bear very gently on the paper. The large drum is covered with a thick band of rubber, and is so light that it can easily be lifted away from the rollers carrying the design, as is always done in getting the press ready for work. It is, of course, absolutely necessary that the different colors should each come in their proper place, and so the small design rollers are all run by one large cog wheel, into which they are all geared. The color is taken up on cloth, in the same way as for the grounding, from little troughs or fountains near each of the design rollers, but it is pressed directly against the latter from the cloth itself as the rollers revolve, and each separate color is printed in succession as the large drum moves around.

Perhaps one of the most interesting details connected with the printing is the method of drying. Considerable time is required to thoroughly dry these heavy bodied pure water colors, and to do this work quickly and effectually the end of the paper first coming from the press is taken up and carried along by an endless belt, at nearly the height of the ceiling, and for a distance of some fifteen feet; the middle portion will then sag down, when a wooden slat is dropped on buttons on this belt, and taking the paper as it is coming from the press, carries it a long and upward from that point, making a loop, for each fourteen or fifteen feet of the roll as it comes out. These slats carrying the loops of freshly printed paper are being constantly pushed forward on overhead railways which extend the whole length of the room, and underneath these railways are lines of steam pipe, each floor having special ventilators to carry off the moisture. At the end of the room there is an ingenious automatic arrangement by which the overhead railway carries the paper around a turn and back over a line parallel to that on which it came from the press, and so it continues to travel back and forth until thoroughly dry.

In making the bronzed papers, or those which have more or less of their patterns in silver and gold, the drying of the other colors must be effected before the bronzing. The size which is to carry the bronze is made especially for this purpose, and, when the colors which have been printed are entirely dry, the size, printed also at the same operation, is just in the proper condition to take and firmly hold the bronze. This is put on in a box-like machine with many brushes, into which the paper passes continuously from the press, after it has gone through its journey over the steam pipes on the overhead railroad.

Where embossed papers are wanted, in any style, the otherwise finished paper is simply run under a steel roller, of the desired surface, whereby it is pressed against a hard packing to give the required effect.

From the bronzing press, as from all the others, the paper proceeds, in the same manner as before, to the small machines for rolling, operated by girls, the work of which is shown in one of our pictures. Attached to each printing press is a gauge which indicates how many rolls are run, and makes a slight cut on the paper at the exact length required for each roll. The end of the paper being fed to the roller, it quickly turns until stopped by the operator at each of these cuts or marks, when a knife cuts it off, the roll is removed, and another roll started. This is the final operation of the manufacture. As the loops of paper are pulled out in the rolling, the slats which have suspended them drop at a certain point, to be gathered up and taken back to the presses.

One of the most important departments of the work, however, and the one which comes first in all the higher grades of goods, is the making of the designs for new patterns and styles. Old patterns are, nowadays, entirely unsalable, and the rule is that each year's patterns must be entirely new and distinct from those of the preceding season. So much so is this the case that the blocks are not saved, on the supposition that some old pattern might again become fashionable. It will be readily seen that this condition imposes upon manufacturers who have to constantly supply large lines of new and attractive patterns a task of no small magnitude. Messrs. Christy, Shepherd & Garrett have always stood in the front rank in their trade in this respect. They have artists regularly in their employment the year round, and also receive many patterns for competition from Europe as well as at home, and from the large number thus collected make selections of those they deem most meritorious. The artist makes the pattern and colors it as he deems most appropriate; but of any pattern they decide to use they make a great many different styles, by using different grounds with different combinations of colors, bronzes, etc., so that from one pattern sometimes as many as forty different styles are made.

From the designer's hands the pattern, after it has been accepted by the firm, goes to the block-cutting department shown in one of our engravings. Here it is drawn in outline on cylinders of wood carefully prepared to be of the exact size, and as many drawings made on different cylinders as there are to be colors in the pattern. The workman

takes one of these cylinders and drives, in the line of the outline, little strips or pieces of brass, or it may be bits of brass wire, if a row of dots is wanted, or brass otherwise shaped to make a variety of small figures. A wire-drawing machine, with an assortment of dies, is kept to make many of the shapes wanted. When a large place is to be filled in to be printed in one color of which this brass work may form the outline, as a leaf, the center of a flower, etc., this space is filled with felt, firmly packed in. This brass and felt work, giving a perfect engraving on the circumference of the cylinder of all there is of one color to be worked in a pattern, stands up nearly a quarter of an inch from the wood; but that its surface may be entirely even and true, the face of the brass work is turned down under a file, and the whole is finally finished under an emery wheel.

Notwithstanding that, in nearly all of the operations of this establishment, the machinery works almost automatically, the firm employ during the busy months about 200 hands. The premises they occupy include a building 350 by 100 feet, and five stories high, besides several detached buildings in the rear. Their goods are exported to some extent to Europe, Australia, and South America, and have a large sale in every part of the United States; so that, although their facilities would seem to be so ample, they are frequently troubled to get the goods ready as fast as they are ordered. The total production last year amounted to about 6,000,000 rolls. The firm is one of the oldest, if not the oldest, in the country, having been established in 1836 by the late Thomas Christy, who died in 1874.

#### THE DEMAND FOR HEAVY HORSES.

The *Factory and Farm* states a fact which we have observed to exist in this city for some time past, *i. e.*, an increase in the number of large horses used on trucks and heavy business wagons. During the past fifteen years, the writer remarks, there has been a great change in the demand for horses in this country. Formerly nearly every one bred in relation to speed and endurance. Now a large proportion of farmers breed with a view to increasing size and strength. This change is not the result of caprice. There has been a steady, increasing demand for heavy horses, and a corresponding falling off in the demand for light ones. Fashion has had little to do in the matter. Heavy horses are wanted because they supply an existing want. From present appearances it will be many years before the supply of heavy horses will equal the demand. The country is now well supplied with horses. At no time in its history, perhaps, were there as many horses to a given number of inhabitants as at present. Small work horses are low, but heavy draught horses continue to be high.

The importation of Clydesdale and Percheron-Norman horses increases every year. The first that were brought over were regarded as very uncertain ventures. At present they are of no doubtful value. The importers of horses from France and Scotland have suffered none of the reverses of the importers of short-horn cattle. With rare exceptions they have become rich. From present appearances we shall soon be sending Clydesdales to Scotland and England, and Normans to France and Belgium. The value of heavy draught horses was recognized in the Old World before it was in the New. Now that their worth is appreciated here, all persons having teaming to do seem anxious to procure them.

Large horses are less liable to injuries from the swinging of the poles of wagons than small ones. Their bones are firmer, and they are commonly more hardy. Large horses are more economical as respects harness, stall room, feed, and work required to take care of them. In all the countries of eastern Europe heavy horses have taken the place of light ones in general farming operations. That American farmers will soon generally employ heavy horses in field work seems certain.

#### Dangers of Elevator Cables.

To the Editor of the *Scientific American*:

I am informed that the superintendent of a well known hotel and apartment house, near Union square, this city, in order to learn what effect the continued bending and unbending of the wire elevator cable causes by passing over the pulleys and around the drum, detached the cable and, to his astonishment, found it actually rotten. In bending it twice across his knee it broke. This cable had been in use only two years. If this constant bending and unbending the cable causes such a disintegration, should it not be more widely known, that examinations may be made and possible disasters prevented? SAMUEL SWAN, M.D.

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[In view of the facts herein stated, we hope that the proprietors of elevators everywhere will cause frequent examination of their lifting ropes to be made. We think that the rope above mentioned must have been composed of extremely poor stuff. It is well known that properly made wire rope will stand the bending of elevator service better than any other known material and will last many years. If it has not been done already, it would be an interesting investigation to determine, by special experiment, the average life of such steel wire ropes as are commonly used in elevators. Mr. J. Burkett Webb, C.E., one of our correspondents, writing from Berlin, gives an account of recent testing experiments that he there witnessed, in one of which a steel rod fifteen inches long and one inch diameter had been bent over twenty millions of times, and was expected to stand some millions of bends more.