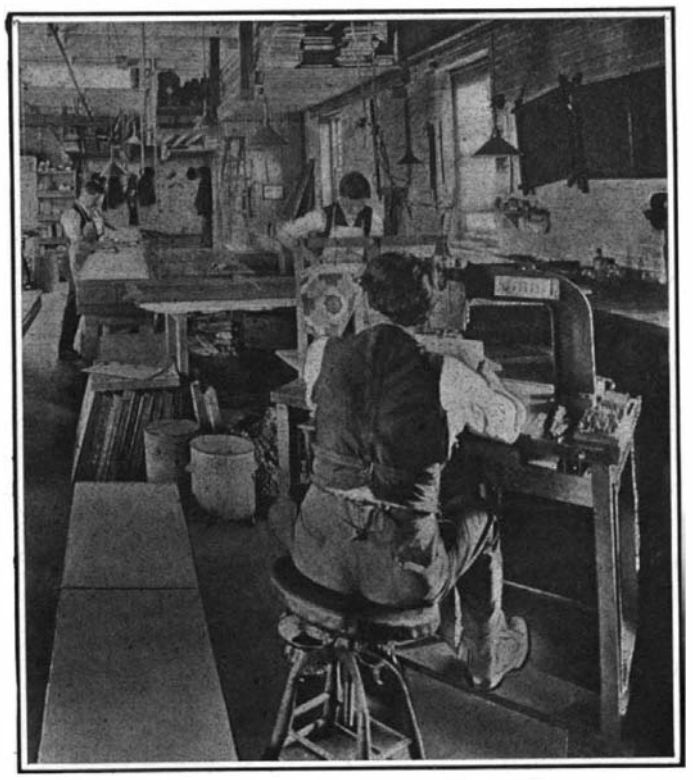
HOW LINOLEUMS AND OILCLOTHS ARE MADE.

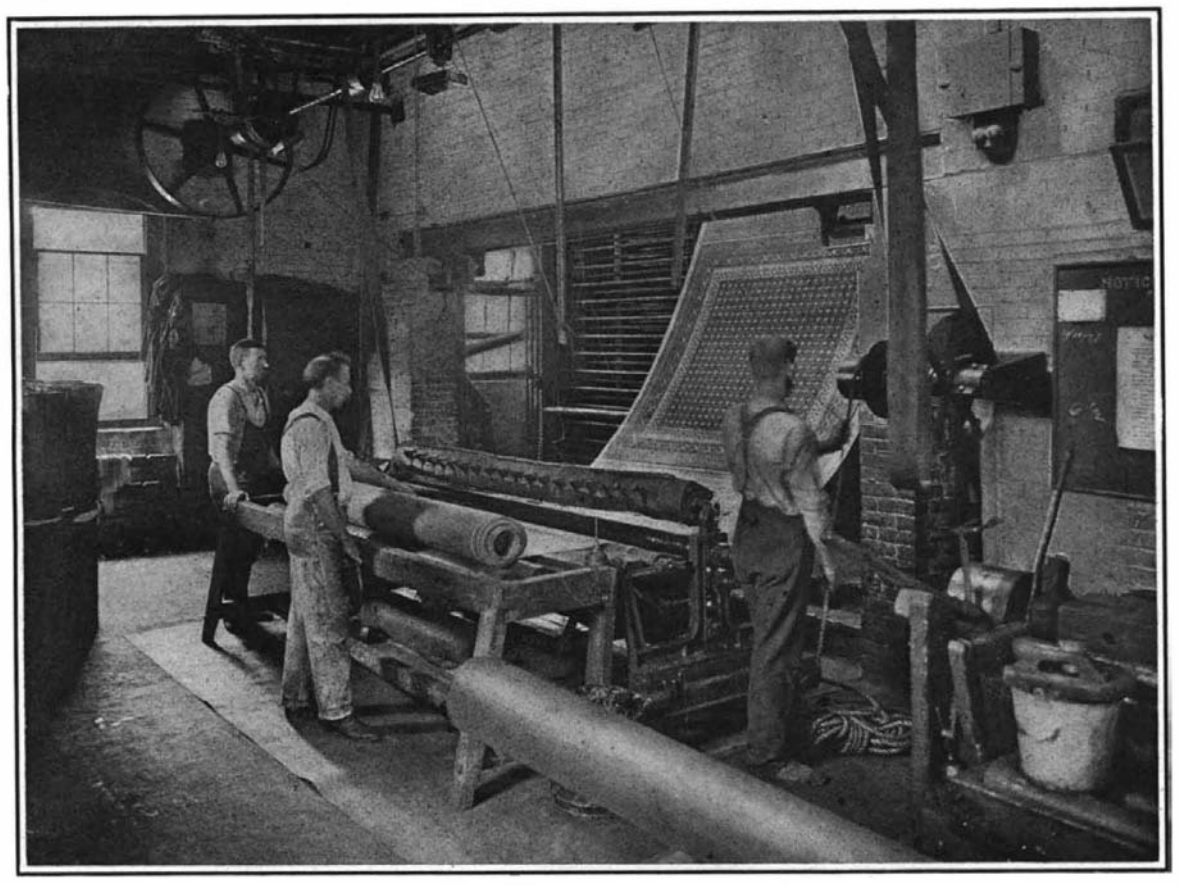
In the year 1804, so the story goes, there lived in England a painter, John Buckley by name, whose business it was to paint designs, or rather a design (his artistic endeavors being limited to the painting of large black and white diamonds) on wooden floors. But a serious obstacle to his success lay in the fact that the paint took too long to dry, entailing considerable inconvenience and occasionally loss of business to his patrons. In his efforts to find a remedy for this evil, Buckley hit upon the plan of painting the design on canvas and allowing it to dry before laying it on the floor. He put his idea into practice, and although, to be sure, the result was crude as compared with oilcloths of the present day, the idea took, and the oilcloth industy was born.

The facility with which this painting on canvas could be accomplished suggested a wider range of design, and for some time stencils were used with very good effect. Then the designs were cut on blocks, substantially as at the present time, and printed on the canvas.

The first oilcloth made in this country was in Philadelphia, in the year 1807, by one John Dorsey, but the first manufacturer of any consequence was Isaac Macauley, who took over Dorsey's little shop and built up an important business from it. Only by the shrewdest financial ability and business acumen did Macauley succeed, for many years, in staving off financial disaster, so great was the cost of manufacture and so slight the demand, but finally in 1837 his long fight came to an end, and Thomas Potter, of Philadelphia, purchased the plant, which was then located on Spring Garden Street, and was known as the Bush Hill Oilcloth Factory. This date marks the establishment of what is now the oldest and largest factory for the making of oilcloths and linoleums in America—a plant occupying an area of a little over ten acres, and comprising more than fifty buildings.



Section of the Block Department. Here Designs Are Originated and Printing Blocks Made.



Varnishing Machine. The Oilcloth Passed Through a Trough of Varnish in the Machine and Thence Into the Heater.

In those early days the canvas backing for oilcloths (linoleums being then unknown) was spun from flax grown in Pennsylvania, and was sized (the process of filling up the interstices of the canvas with a paste-like substance preparatory to being treated with subsequent coats of paint or priming), primed, and printed by hand, then hung up to dry by natural heat. This slow method made the oilcloths very expensive, as the manufacturers were entirely dependent upon weather conditions for results. The canvas or burlap was made into sheets of 60 feet by 21 feet, and it took a year and over to make a piece of oilcloth ready for the market. From this it will be appreciated that only the very well-to-do could afford so expensive a luxury.

This hand method of making oilcloths continued in vogue until 1865, when new methods were introduced for sizing and coating the goods, and artificial heat came largely into use for drying purposes—improvements which resulted in placing the goods within the reach of the general public. Then came the invention of linoleum in England in 1868. Other milestones in the progress of this industry are the invention of a machine for printing oilcloths and linoleum and a machine for making inlaid linoleum. These machines will be presently described.

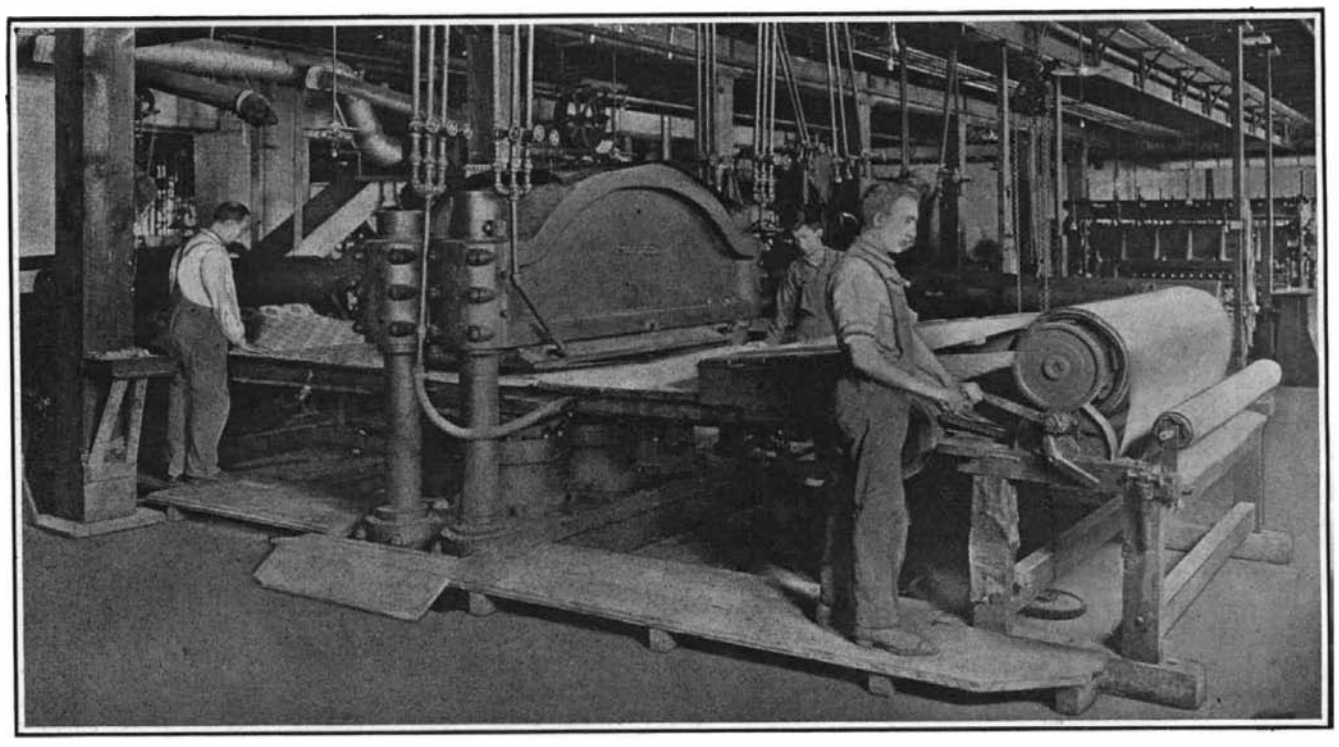
To those who may be unfamiliar with the difference between linoleum and oilcloth, we will say that while the latter consists of burlap treated with numerous coats of paint, linoleum, on the other hand, consists mainly of linseed oil boiled to a rubber-like consistency and mixed with gums and cork dust, which compound is rolled in a thick layer on a backing of burlap.

HOW LINOLEUMS ARE MADE.

Before proceeding further it is necessary to state that linoleum is made in three grades, namely, the "straight-line-tile inlaid linoleum," the "granulated or molded inlaid," and the "printed and plain linoleum." We will describe first the process of manufacturing the finest grade or straight-line-tile inlaid linoleum. The linseed oil is boiled in large pots mounted on trucks, which are run over open brick fireplaces. Here the oil is boiled for several hours, or until it reaches the proper consistency. Great care is exercised to prevent the oil from boiling over, for such an accident would result in a conflagration. From time to time the oil is stirred, and a spray of water is used to make the boiling fluid subside. Every facility is provided for confining the fire to a single pot should it boil over, and for drawing the pot into a fireproof inclosure, where it may burn without damage to the surrounding buildings.

After the oil has been thoroughly boiled or oxidized, the next process is to make it into "skins." Several large buildings are set aside for this work. Each building is filled with canvas sheets hanging parallel about four inches apart from a rack at the top of the building. The oil is poured over these sheets from a carriage mounted to travel over the track, and thus a gummy layer is deposited on the canvas. The temperature of the room is kept at about 165 deg. F., so as to prevent the oil from gumming too rapidly, and to insure an even distribution over the canvas sheets. The sheets are flooded twice a day until a layer of oil has accumulated to the required thickness. In about four or five weeks the skins are ready to be cut down.

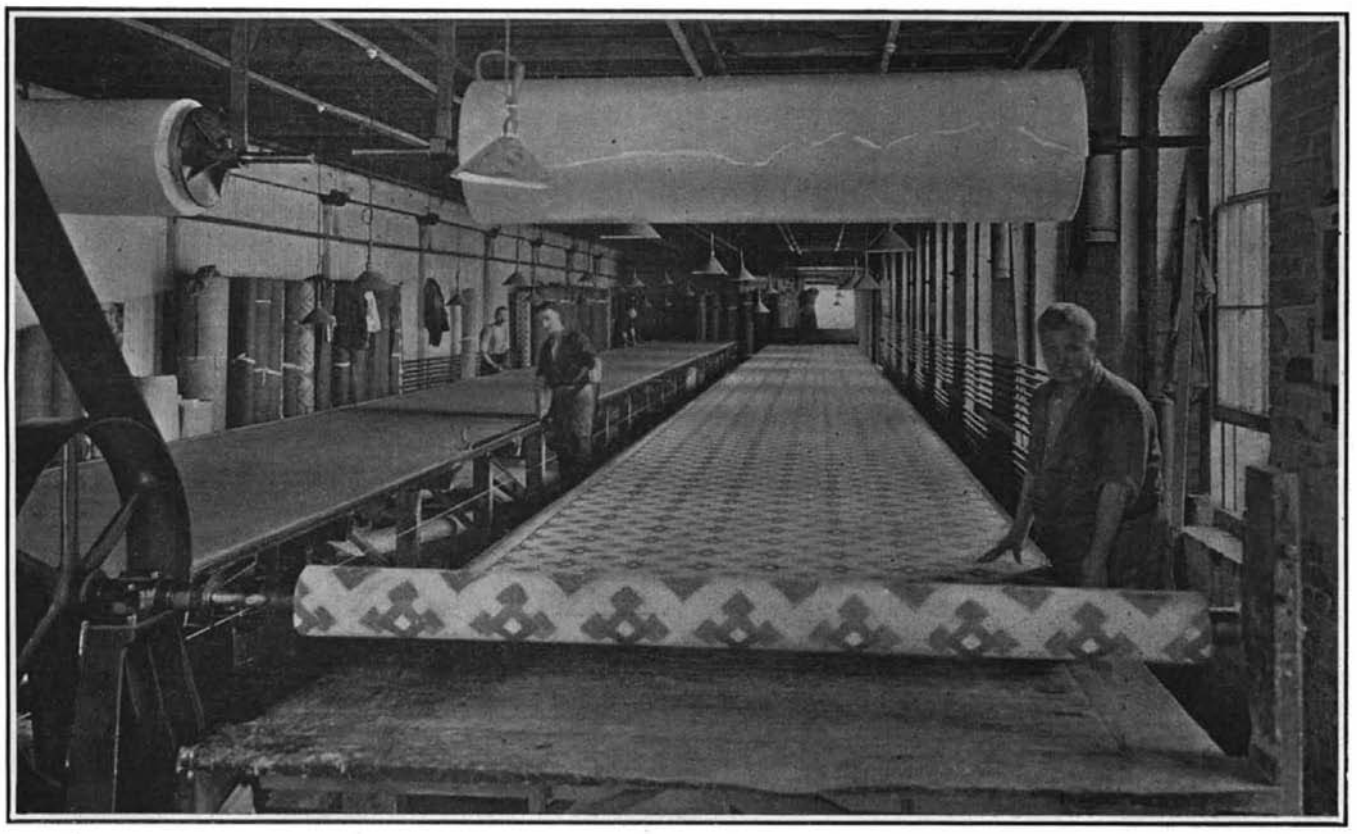
The next step is to pass the skins through the grinding machine. This consists of two smooth steel rollers, between which the skins are ground into butter-colored flakes. The flaked oil is mixed in a hot kettle with rosins and gums, and formed into large blocks of a soft, rubber-like consistency. It is then passed through what is known as a "German mixer." This machine grinds the oil and thoroughly mixes it with powdered cork and wood pulp, at the same time adding the required color pigment. The compound is then run through calender rolls, and made into sheets about 18 inches wide by ⅛ inch thick. These sheets while in a soft, gummy condition of a consistency not unlike fairly stiff workable putty are placed in the inlaying machine. The inlaying machine is equipped



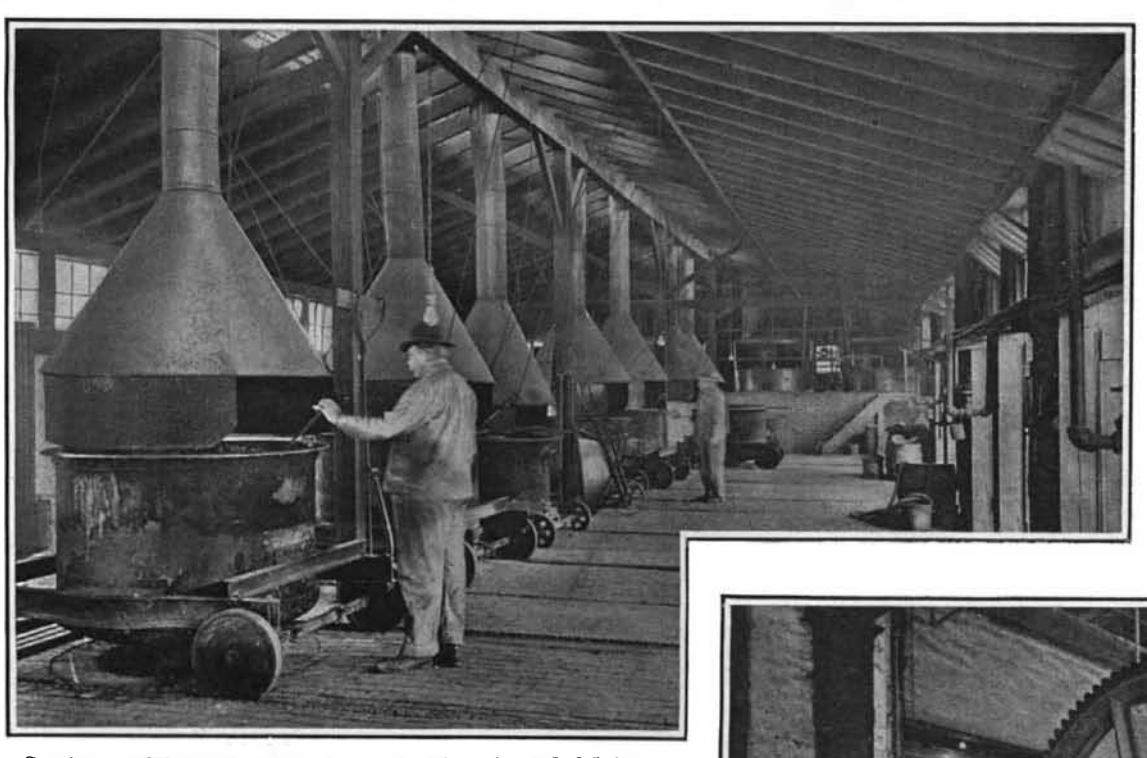
One of the Huge Hydraulic Presses Used in the Manufacture of Straight-line-tile Inlaid and Molded Inlaid Linoleums.

with dies corresponding in shape to the various forms called for in the design. It is provided with a separate die for each color. These dies operate simultaneously to stamp out the different shapes or tesseræ in their respective colors, and adjust them in their proper positions on the prepared burlap. It will be understood that the dies are arranged one behind the other, and operate independently over their own respective portion of the burlap, the latter being moved forward after each operation of the dies to the next successive die to receive the next shade of tessera. The dies are operated by hydraulic pressure, and exert only sufficient pressure on the tesseræ to make them cling to the burlap. This machine marks an important advance over previous methods of making inlaid linoleum. As heretofore done, the tesseræ are stamped out individually in various dies, and then arranged by hand on the burlap. Obviously, the inlaying machine materially reduces the time required for this operation. The inlaying machine, it may be stated, was designed and built by the Thomas Potter Co., which has a patent on it, and the machine we illustrate on the front page is the only one of its kind in the world.

From the inlaying machine the goods pass to a hydraulic press, where, after being thoroughly inspected to replace broken tesseræ or repair any defects, it is subjected to a pressure of 3,000 pounds to the square inch twice in succession. This tremendous pressure effectually squeezes the stamped-out tiles and the burlap into one homogeneous sheet without seam or joint anywhere. After this the goods are drawn into a heater (a room equipped with hundreds of racks 90 feet long, and arranged one above the other about 8 inches apart) and there left under an approximate temperature of 145 deg. Fahr. for four or five weeks until cured. This process renders the linoleum extremely tough and elastic, with a wearing quality that is little short of marvelous. After a final inspection to discover any defects, the goods are stamped and prepared for shipment.



Inspection Tables Where Goods Are Carefully Examined for Defects Before Being Made Ready for Shipment.



Section of Oil-Boiling Department. The Linseed Oil is Boiled to a Gelatin-like Consistency.

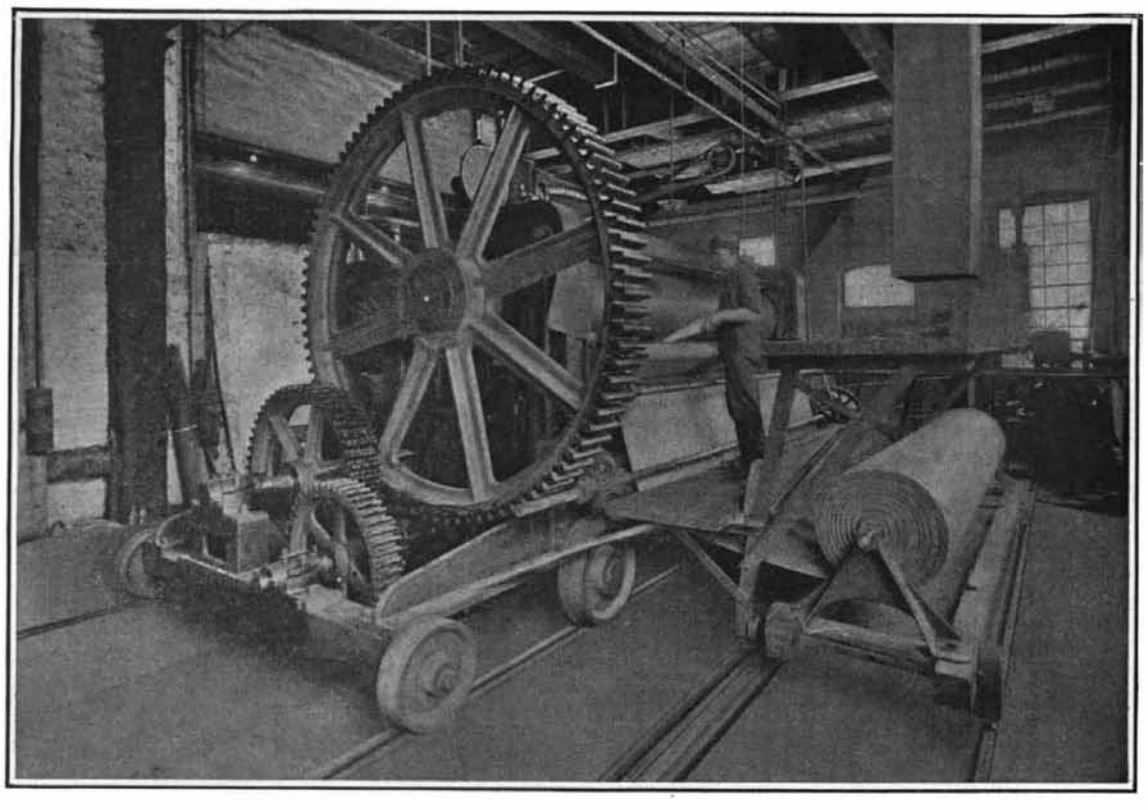
The burlap used in making this, as well as the other grades of linoleum, and the oilcloths, is imported from Dundee, Scotland. In preparing the burlap for linoleums, it is first run through a coating machine, which lays on a coating of red paint, known as backing; then it passes into a heater, a large room 65 feet high, where it is suspended from the ceiling in closely arranged folds, and left over night in a temperature of about 150 deg. Fahr.

GRANULATED OR MOLDED INLAID LINOLEUM.

In the making of molded inlaid linoleum, instead of rolling the material as it comes from the "German mixer" into sheets, it is passed through a machine known as a scratcher, which reduces it to a granulated form. The granulated matter is then placed in a sifter, in which a series of revolving arms beat the material through a screen. The linoleum compound is similar to that used in the best grade, though of a slightly cheaper quality, but the method of manufacture makes the finished product considerably cheaper, although at the same time rendering its wearing quality inferior to that of the straight-line-tile inlaid grade. The designs ordinarily used in this grade of linoleum are composed of a series of diamonds arranged to form various patterns. A plate perforated with diamond-shaped openings and having somewhat the appearance of a lattice is used as a mold, through which the granulated material is sifted on to the prepared burlap. To separate the various colors into their respective diamonds as called for by the pattern, a series of pans are laid over the mold, each pan being provided with selective openings that register with the openings in the mold which are to receive granulated material of a particular color. After this color has been sifted into the molds, another pan is set in place as a template for the next color, and so on for as many colors as may be desired. After the entire mold has been filled, it is lifted from the canvas, leaving the granulated linoleum arranged in the desired pattern. This is then subjected to hydraulic pressure, as in the case of the best grade inlaid, and is thus pressed into the burlap backing. The difference in the method of manufacture between the two grades is worth noting. In the case of the straight-line-tile inlaid, the linoleum composition is first rolled into concrete sheets before being stamped out, and is pressed into the burlap while in a soft cohesive condition under heat; while in the case of the molded inlaid type the material is granulated, not rolled, and is then subjected to hydraulic pressure, producing a texture of a more open and coarse nature and, consequently, to a much greater extent disintegrable. The molded linoleum may be readily distinguished from the straight-line-tile by the ragged edges of its design. It is estimated that if a piece of molded inlaid linoleum will last five years on a given floor, the straight-line-tile inlaid will last twenty years.

PLAIN AND PRINTED LINOLEUMS.

In the making of plain and printed linoleums primed burlap is used. The linoleum composition is applied to the burlap by passing it with the burlap between large calender rolls measuring 160 inches across the face and weighing about 15 tons apiece. The quality and thickness of the different grades are regu-



One of the Calendering Machines. The Weight of This Machine is About 80 Tons; the Rolls Measure 160 Inches Across the Face.

HOW LINOLEUMS AND OILCLOTHS ARE MADE.

lated by the distance between the rolls. After passing through the calender the coated burlap is drawn into the heater, where it remains several days under a temperature of about 160 deg. Fahr. Much of this linoleum is sold plain, but that which is to be printed takes its course to the printing room, where it runs through a machine that lays on the required designs in colors.

The invention of a printing machine for linoleum marks one of the most important improvements in the industry. Many experiments were made along this line, but it was not until the year 1892 that a successful high-speed printing machine was built, and this was installed at the Thomas Potter Company's plant in Philadelphia, Pa. This machine proved such an unqualified success, that it is being used to-day without any material change. It has a range of from three to nine colors, working on an area of about 120 square yards at one time, completing 18 inches of the design, full width, at each impression, and printing about 24 square yards a minute. In the old-fashioned way of hand printing, two men working together could print about 150 square yards per day. Now, each machine produces approximately 8,000 square yards daily, doing the work of over 100 men.

After leaving the printing machine, the goods pass into a heater, and are left there under a temperature approximating 145 deg. Fahr. until thoroughly cured and ready for the market In this connection it might be well to mention still another grade of linoleum known as "cork carpet." As the name implies, this grade is composed of linoleum composition with a much larger percentage of cork, and is made in greater thicknesses than the plain linoleum.

In the early days the use of linoleum was confined almost entirely to kitchens and vestibules of private residences, but as years passed, its wonderful utility became more widely known and appreciated until to-day we find it on the decks of modern men-of-war of all nations, steamships, pleasure boats of all descriptions, automobiles, parlor cars, hospitals and sanitariums, dining rooms, cafés, colleges and Sunday schools—in fact, its uses are too varied to enumerate.

THE MAKING OF OILCLOTHS.

The burlap used in oilcloths is first drawn through a sizing machine, which applies a substance to fill up the interstices and prepare the surface for the priming which follows. After the priming the burlap is dried in a heater, and it is then ready to receive the coatings of red paint. These coatings (from three to five according to the quality of oilcloth to be made) are applied by machinery, the burlap being passed under a knife blade, set by screws, which distributes the paint evenly and regulates the quantity. After each coat the goods are run into the heater, and dried before receiving the succeeding coat. This done, the prepared burlap is passed through a pumicing machine, which makes the surface smooth for the printing. The process of printing the design on the oilcloth is done in the same way and with the same machinery as in the linoleum. After the printing the material is again put in the heater to dry, and then taken to the varnishing machine to receive a finishing gloss. The oilcloth is now passed into the drying room, where it is dried in a few hours.

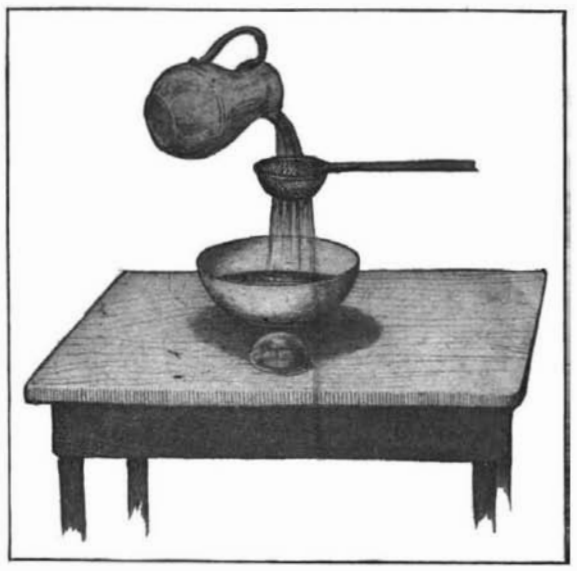
HOW TABLE COVERS ARE MADE.

Unlike the floor coverings, the foundation of table and enameled oilcloth is cotton sheeting. The rolls of cotton are first run through a calendering machine, and then given several coats of a compound consisting of linseed oil and China clay, with the necessary ingredients to give the desired color. The goods are run into a heater to be dried after each coating. When the several coats have been applied, the goods are passed through a pumicing machine, which removes all rough particles from the surface. The printing machine is a cylinder printing press, similar to those used in the manufacture of wall papers and cotton prints. The designs are etched on copper-covered cylinders, each cylinder carrying a certain color and part of a design. The final stage of the operations is to pass the material through a varnisher, then into the drying room, where it is left for twenty-four hours, when it is ready for the market.

The Siamese Minister of Public Works has received the sanction of the king to the proposal to acquire and construct an entirely up-to-date telephone system in Bangkok. The system decided on is the central-battery system. The minister is now engaged arranging for a new cable from Koh-Si-Chang to Sirachi with connection to Bangkok.

SOME INTERESTING TRICKS.

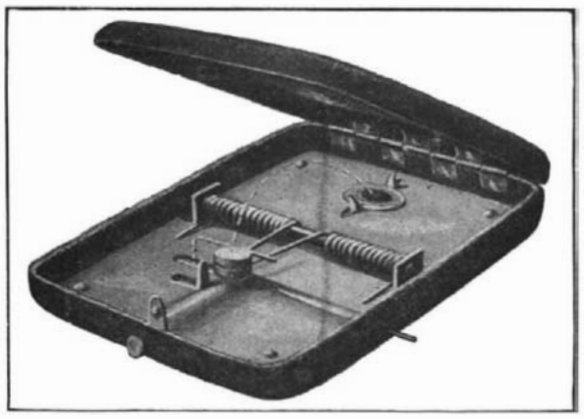
A few little parlor tricks often while away time which would otherwise hang heavy on the hands. One of the best we have seen recently is the " magic sieve." An ordinary wire-cloth sieve with a handle is shown to the larger or smaller audience, but they do not see a celluloid shell which conforms to the bowl of the sieve.



The Magic Sieve.

In performing the trick the celluloid shell is placed out of sight at the back of the bowl. Water is poured through the sieve into the bowl, and it is deposited face downward on the table over the celluloid shell. Both are picked up together and the water refuses to leave the sieve. Both the celluloid shell and the water are turned into the bowl, and the liquid passes through as before to the mystification of the audience.

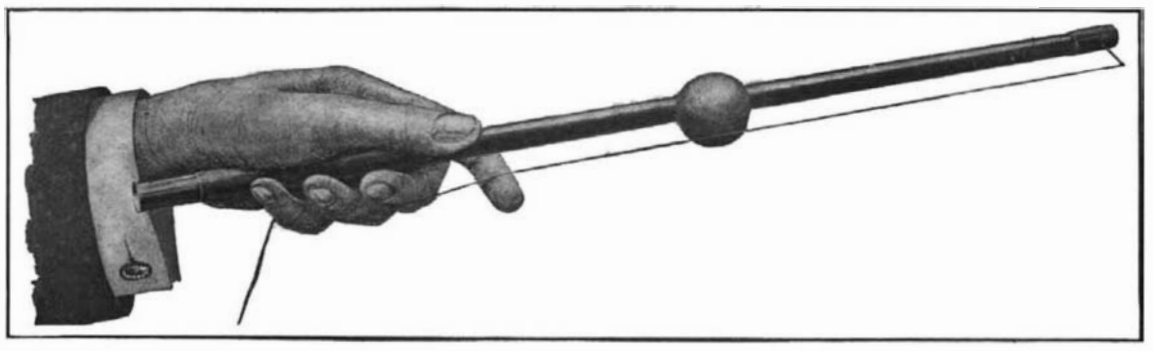
Another clever trick is also easily performed. Anyone attempting to balance a ball around a polished stick will realize the extreme difficulty of such a feat. Nevertheless, the performer having given to the spec-



The Magic Jewel Case.

tator for a minute inspection the wand which he may be using in some other trick, also the ball, proceeds to carefully place the ball at the center of the wand, when it will remain stationary, then it will roll up and down the entire length of the wand, after which the wand and ball are again freely examined.

The trick consists in the use of an ordinary wand, such as magicians use, with metallic ferrules at each end, a duplicate ferrule fitting loosely over the one



A Clever Balancing Act.

SOME INTERESTING TRICKS.

at the end. It is provided with a short thin steel arm projecting from its end at right angles. At the end of the arm is a small iron, to which a fine black thread is attached. The thread is several inches longer than the wand. The prepared ferrule the performer has palmed, and after examination of the wand it is secretly put on its end, the thread is pulled down into the left hand holding the other end, and twisted around the middle finger. The thread on being stretched forms a kind of a bow, and when the bow is placed on the wand the ball will run up and down with the greatest ease as the wand is lowered or raised. The illusion is perfect, even at a short distance, to the audience, the ball appearing as rolling on the top of the wand. The ferrule is again palmed at the conclusion of the trick, so that the wand may once more be given for inspection.

The "Magic Jewel Case" is an innocent-looking affair covered with plush, and might contain a diamond pendant. As soon as the button is pressed an explosion takes place, and the case opens with a loud bang. A detonator is given a catapult motion by a coiled wire spring and strikes a cap which is secured to the anvil. While the case is being closed, a detent wire passes across the ends of the coiled springs, securing the detonator from coming into action. As soon as the case is closed, the detonator bears against the cover of the case. We are indebted to Mr. Martinka for these tricks.

Official Meteorological Summary, New York, N. Y., June, 1907.

Atmospheric pressure: Highest, 30.23; lowest, 29.52; mean, 29.94. Temperature: Highest, 88; date, 25th; lowest, 45; date, 2d; mean of warmest day, 79; date, 22d; coolest day, 48; date, 2d; mean of maximum for the month, 73.6; mean of minimum, 58.7; absolute mean, 66.2; normal, 68.9; deficiency compared with mean of 37 years, —2.7. Warmest mean temperature of June, 72, in 1888, 1892, 1899, 1906. Coldest mean, 64, in 1881. and 1903. Absolute maximum and minimum of this month for 37 years, 97, and 45. Average daily deficiency since January 1, —1.9. Precipitation: 3.29; greatest in 24 hours, 1.01; date, 29th, and 30th; average of this month for 37 years, 3.25. Excess, +0.04. Accumulated deficiency since January 1, —0.54. Greatest precipitation, 7.70, in 1887; least, 0.86 in 1904. Wind: Prevailing direction, south; total movement, 6.922 miles; average hourly velocity, 9.6; maximum velocity, 48 miles per hour. Weather: Clear days, 10; partly cloudy, 13; cloudy, 7; on which 0.01 inch, or more, of precipitation occurred, 11. Thunderstorms, 5th, 26th.

A New Invention for the Theater.

American theaters have been equipped with so many conveniences, one would suppose every possible need of the theater-goer had been fully supplied. Still, another novelty will make its appearance with the opening of the coming theatrical season, a novelty which is nothing more or less than a very ingenious mirror for the use of women. The invention is known as the opera mirror, and has been patented by Mrs. Bessie M. Suter, of Louisville, Ky. It is so applied that by simply touching a leather fastening it can be placed at any angle, so that a woman may adjust her hat easily and conveniently after the performance. In addition the device provides a means for the disposal of hats and wraps, so that the necessity of spending much time in a cloak room is obviated. Mrs. Suter claims for her device ease of adjustment, simplicity of construction, strength, and durability. The invention was first brought to Mr. Daniel Frohman's attention by Mr. James W. Morrissey, managing director of the Joseph Jefferson Monument Association. Mr. Frohman will probably use it in his New York Lyceum Theater.

CAPTIVE BALLOONS IN THE GERMAN ARMY AND NAVY.

BY DR. ALFRED GRADENWITZ.

Because of the great difficulties frequently encountered in choosing a conspicuous point from which to inspect an enemy's position, captive balloons have been for many years adopted in the German Signal Service. The first type used in this direction was the familiar spherical balloon, which, however, is fit for use only if the atmospheric conditions are favorable. A cylindrical type of balloon was therefore first suggested in 1893 by A. Riedinger, of Augsburg. This balloon, being placed in an inclined position against the wind like a kite, was imparted an upward pull reinforced by the wind itself. But simple though this construction seemed to be, the desirable stability was not obtained before many difficulties had been overcome; in fact, a purely cylindrical balloon with hemispherical ends, so far from being stable, will perform spiral curves in the wind and quickly reach the ground. Lieut. von Parseval, however, developed the balloon to a satisfactory stage of reliability, so that the observers could work freely even in the case of heavy winds.

A schematic view of the improved type of balloon now being used in the German army is given in the

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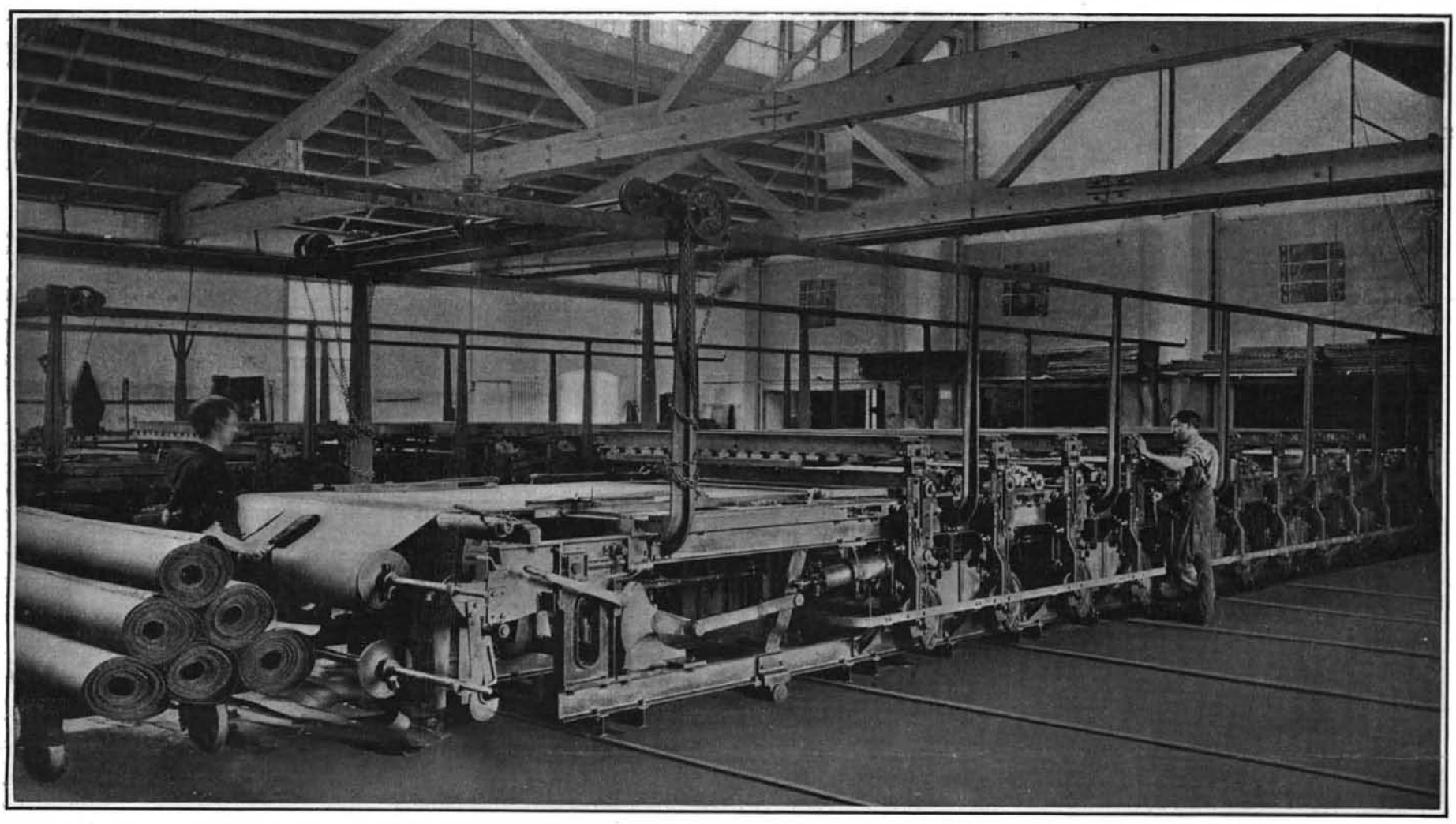
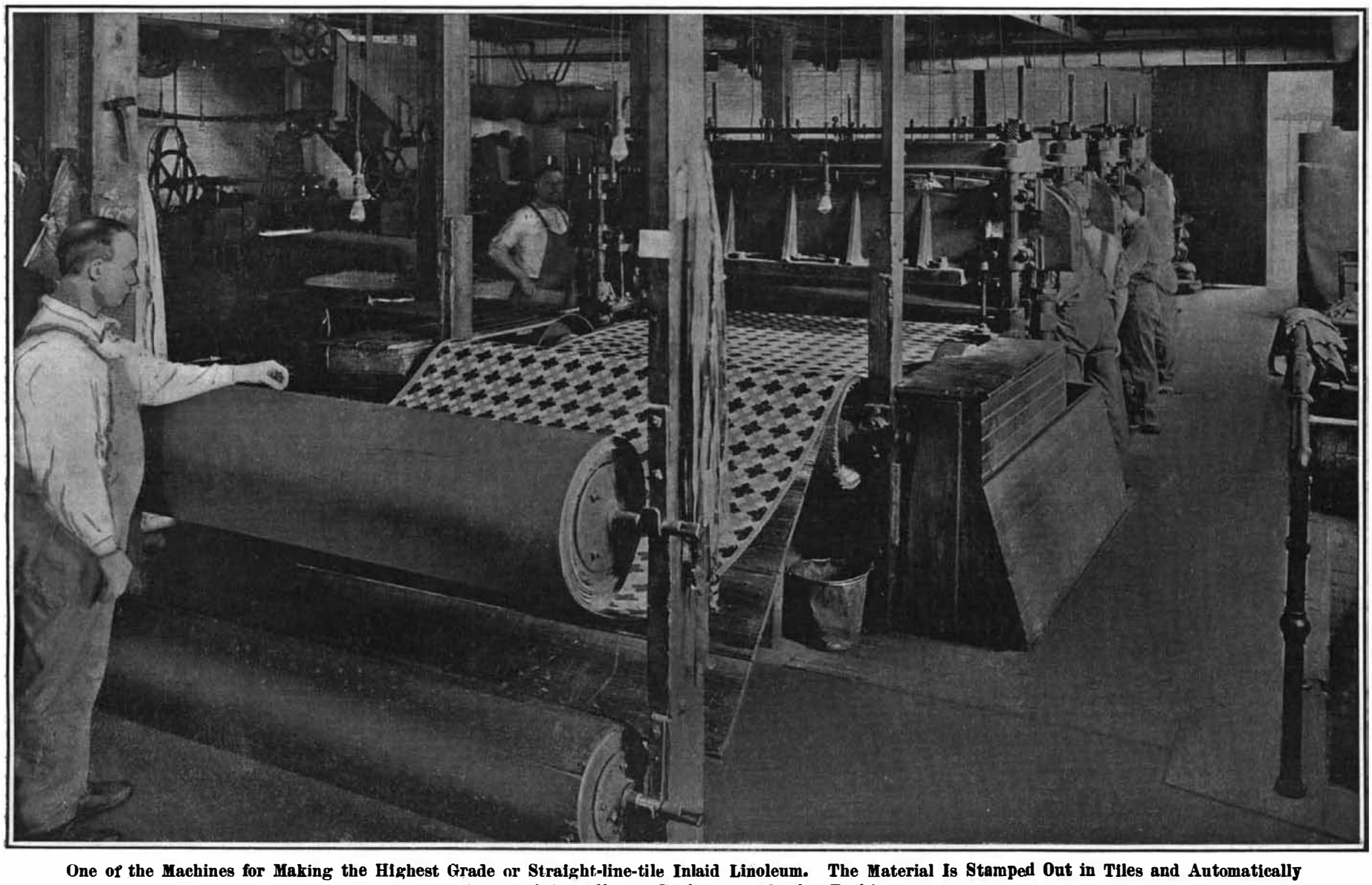


High-Speed Printing Machine Which Prints the Color Designs on Floor Oilcloths and Printed Linoleums. The Machine Works on an Area of 120 Square Yards at a Time, Completing 18 Inches of the Design Full Width at Each Impression and Printing 24 Square Yards per Minute.



One of the Machines for Making the Highest Grade or Straight-line-tile Inlaid Linoleum. The Material Is Stamped Out in Tiles and Automatically Arranged According to Design on a Burlap Backing.

HOW LINOLEUMS AND OILCLOTHS ARE MADE.—[See page 28.]