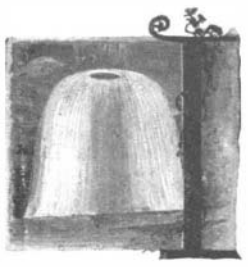
THE MANUFACTURE OF HIGH GRADE LINEN LEDGER PAPER.



a series of articles published in the SCIENTIFIC AMERICAN of March 19, April 30, and October 15, 1898, we described and illustrated the process of manufacturing paper from wood pulp. Paper of this kind is used for an endless variety of purposes which includes (mentioning them in the order of their quality, and commencing with the cheapest) "wrapping paper;" cheap or "bogus manila." for manufacture into bags; "best grade manila;" "news papers and hanging papers," and "book papers." These are made entirely from wood, spruce and poplar being the particular varieties employed.

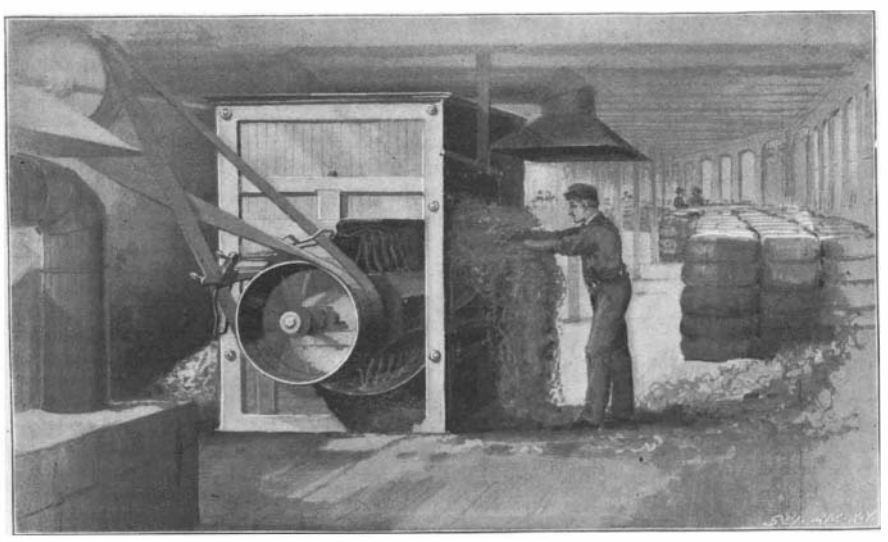
The highest class of paper is known as "fine writing paper," and under this head is included note, bond, bank note, tracing, bank folio, and ledger paper. Much of this is made from a mixture of rag and wood fibers, while the very finest paper of all is made entirely from linen rags and some new cotton. The present article describes the process of manufacturing the finest grades of linen ledger and record paper as carried out at the mills of the Byron Weston Company, of Dalton, Mass., a concern which has been devoted exclusively to the manufacture of this article for the past thirty years.

Before describing the manufacture in detail, it should be explained that in the production of these high grade papers it is necessary to secure great purity and cleanliness throughout the whole process, both in the materials and in their manipulation. Particular attention must be paid to the quality of the water, as in the case of the mills now under consideration, where, although good spring water is available, it was thought best to sink artesian wells and secure a supply entirely free from impurities due to surface drainage. As compared with the cheaper grades, ledger paper requires more time in its manufacture, the total time consumed from the sorting of the rags to the final packing of the finished sheets being six weeks, as against so many hours required in the preparation of the wood pulp papers. The features which are essential in ledger paper, mentioned in the order of their importance, are: 1st, strength; 2d, color; 3d, finish or surface; 4th, erasing and rewriting qualities; and 5th, ability to stand changes of climate without being sensibly affected. The subject of tests is mentioned at the close of this article.

The raw materials consist of new linen clippings from the factories of Belgium, England, Ireland, and France, new cotton from the shirt factories of the United States, and old linen, known as "Italian old linen," from Italy. The last named is thoroughly washed and disinfected and is sealed by the United States consul in Italy before it is shipped to this country. About 2,000,000 pounds of linen and cotton fabric is used up in these mills every year, the proportions being 1,300,000 pounds of high grade linen to 700,000 pounds of new cotton clippings. The cotton is introduced because it has been found by long experience that the proper combination of linen and cotton produces a paper superior to that made from all linen or all cotton.

THE THRASHING ROOM.—The material is first taken to the thrashing room, where it is placed in a closed box (Fig. 5), within which is a drum provided with a number of V-shaped iron beaters. Above the beaters, and extending longitudinally above the drum, is fixed an iron bar, while below it is a curved iron screen. The drum rotates at a speed of 150 revolutions a minute, and by means of the beaters drives the dust through the screen into a dust-box and separates the good rags from the refuse. The refuse or "waste" is put through another thrasher and is then sold to the makers of certain cheaper grades of paper, while the "waste" from the second thrashing is sold to the makers of bag paper.

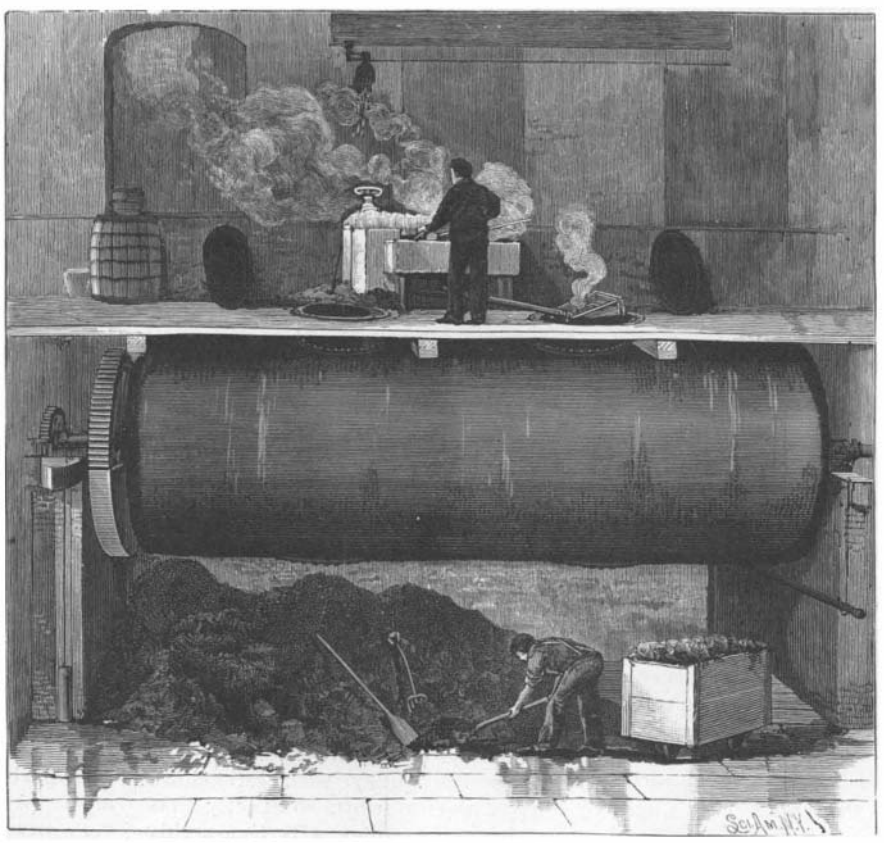
RAG ROOM. — From the thrashers the material is dropped into carts, wheeled to the elevators, and carried up to the rag room (Fig. 7), where from seventy to one hundred girls are engaged in carefully dressing and cutting the rags by hand to the required size, which in nearly all other mills is done by machinery, or a rag cutter. The operators do their work at two long tables which extend down each side of the room. Standing before each girl, and affixed to the table, with its cutting edge facing the table, is a common scythe blade, as shown in the illustration. On the table is a wire screen. The dusted rags are thrown upon the screen, where they are carefully turned over and scrutinized. All foreign substances, such as jute or silk fabrics and all colored rags, are carefully removed. The latter would require chemical treatment, and it is the object of the company to use as little chemicals as possible in preparing the high grade of paper which they turn out, for the reason that such treatment would weaken the fiber and impair its lasting qualities. During the process of cutting, the girls cut the rags to the required size (about four inches in length, or the size of the palm of the hand) by drawing them, a handful



5.—Thrasher, for Cleaning the Rags.

at a time, down the scythes. The cut rags are thrown into baskets and then returned to the table for a second examination. There is a third inspection by the "overlookers," and the rags are finally looked over by the superintendent before being weighed and taken to the dusting room. Although the work done in the rag room might seem to be merely preliminary to the actual work of manufacture, it is actually of the first importance; for careless inspection would result in the introduction of poor or positively harmful material into the paper that would destroy its color, finish and durability.

DUSTING ROOM.—The dusting is done in a closed box in which is a rotating shaft, provided with a number of arms that are arranged spirally upon it, and serve to thoroughly beat the rags and carry away the dust and fine particles of fabric which they contain.



6.—Rotary Lime Boilers.

MANUFACTURE OF LINEN LEDGER PAPER.

In this operation the new and old linens and the cottons are mixed in the proper proportions. After they have been thoroughly cleaned they are ready for transportation from the "Rag Mill" to the "Making Mill."

ROTARY BLEACH.—The first operation in the making mill is that of bleaching. This is done in a large horizontal boiler (Fig. 6) about 6 feet in diameter and 25 feet long, which rotates on a pair of trunnions. The rags are dumped in through a couple of manholes, a solution of lime is run in, live steam is admitted through the trunnions, and the whole mass is boiled, while rotating, for about twelve hours.

RAG ENGINE ROOM.—When the boiling is complete and the vegetable oil, grease, etc., have been thoroughly removed, the rotary bleach is stopped, manholes up, the covers are removed, and the rags are dumped onto the floor and removed in hand carts to the rag engine room. Here they are thoroughly washed with pure spring water, which is drawn from four artesian wells (see initial letter cut) that yield a supply of over 1,000 gallons a minute. The washing engines are similar in construction to the "engine beaters" described in the articles above mentioned on the manufacture of wood pulp. They consist of an oval tank about 3 feet deep, on one side of which is a swiftly revolving drum, which carries on its periphery and parallel to its axis a series of iron blades. The lower half of the drum revolves in close proximity to a curved bed-plate, in which is fixed a series of blades similar to those on the drum. When the tank has been filled with rags and water, the drum is started and the mass is drawn in between the drum and the bed-plate and well drawn out, the friction and rubbing assisting the water in thoroughly cleansing the rags. The pulp slowly circulates round the tank and is again and again drawn in between the drum and the bed-plate, the operation continuing for a space of twelve hours. Fresh water is kept flowing into the tank at one point and the impure water is drawn off through strainers, which allow the water to pass, but hold the pulp. Just before the conclusion of the process a weak solution of chlorine is introduced into the tank. From the washers the pulp is next dropped into a set of drainers (Fig. 3), large brick vaults 10 feet by 30 feet by 15 feet high, which are provided with floors of porous tile through which the water is allowed to drain away.

ENGINE BEATERS. — The bleached rags are now known as "half-stuff," for the reason that they are neither rags nor fiber, being only partially unraveled. In order to thoroughly separate the fibers, the "half-stuff," as soon as it is thoroughly drained, is taken out of the drainers and wheeled in carts to the engine-beaters, which are similar in construction to the washing engines already described, except that there are more knives in the bed-plate and roll. The material is manipulated in the engine-beaters for about eighteen hours; and in this operation great care is taken not to cut the fiber. To this end the knives are much blunter than those used in the wood pulp process, the object being to draw out the rags into fiber and preserve the valuable features of great length and strength of fiber which characterize this high grade linen ledger paper. To give a good color to the paper, a little blue (ultramarine) and red (cochineal) are added in the beaters, with a little resin to size the interior of the fiber and bind the fabric of the paper.

From the beaters the pulp is dropped through copper pipes to the "stuff chests"—large wooden tanks—in which it is mixed with water and agitated by long revolving arms, which reduce the water and fiber to the proper consistency.

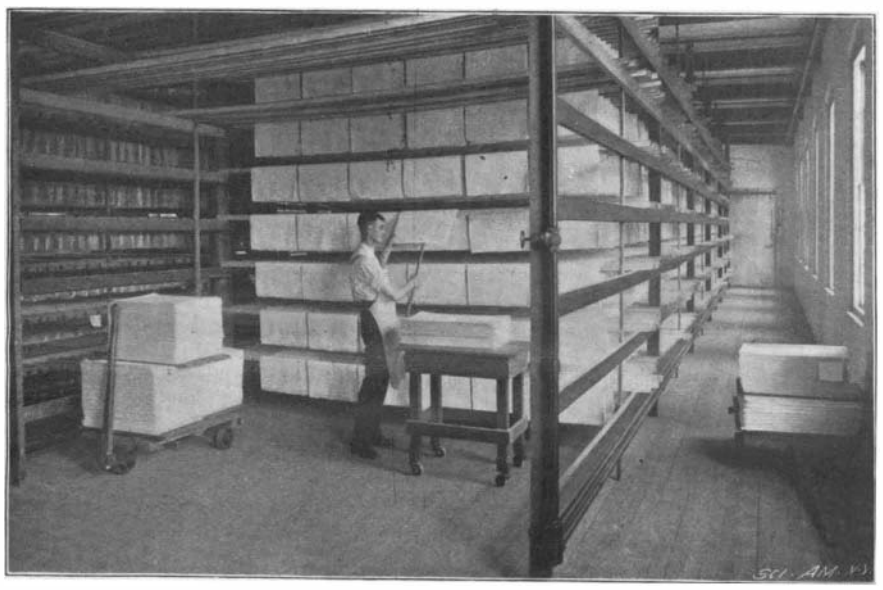
MACHINE ROOM.—From the stuff chest the pulp is pumped up to the "machine room," where it is carefully screened, to take out all foreign matter in the way of hard substances, such as knots or matted fiber, and it is then run out into sheet form on the Fourdrinier machine (Fig. 1).

The pulp first passes into a "flow-box," from which it issues in a broad shallow stream or film onto an endless wire cloth, which has a slight inclination to assist the forward flow of the pulp. The cloth is about 70 inches wide, and the stream of pulp, which in appearance and consistency is not unlike watered milk, is kept from flowing over the edges of the cloth by two endless rubber guides or "deckle straps" which lie upon and travel with the cloth. In order to interlace the fibers, which are floating separately in the water, the wire cloth is given a lateral oscillating or shaking motion, which entangles or interlocks the fibers much as the warp and woof of textile fabrics are interwoven in weaving. As the pulp flows forward, the water drains through the wire cloth, being assisted in this by suction boxes, which bear against the under side of the cloth, and are exhausted by suitable suction pumps. The wire with its layer of pulp now passes under the "dandy roll," which imprints the water mark while the mass is still soft, and then under two successive rolls which

squeeze out some of the moisture. The fiber is next caught up on an endless felt, and passes between a series of rollers which serve to squeeze out part of the remaining moisture. The sheet then begins to travel over and under seventeen successive rolls, at the end of which it is trimmed by having the "deckle-edge" cut off, is slit into sheets of the desired width, and is run through a bath of animal size.

The Byron Weston Company pay the greatest attention to the preparation of this size, as upon its quality and the care with which it is applied depend very largely the quality of the finished record paper. Upon the quality of the sizing depend the ruling qualities of the paper, its erasing qualities, its ability to stand changes of climate and temperature, and very largely its ability to stand continual handling without cracking. The animal size is prepared from rawhide shavings made from the hide of the East India buffalo. The rawhide, which comes to the mill in shredded form, is carefully washed in spring water and boiled at a low temperature, and the resultant liquid is drawn off into vats for further treatment by a secret process. The tank of size stands at the end of the drying cylinders, and after the paper is slit to the proper width, it is run down and through the size, and is then automatically cut to length and laid in piles by the "lay boy."

DRYING AND SEASONING LOFT.—It will be remembered that in the wood pulp process the paper is dried in passing through the steam-heated rolls of the Fourdrinier machine. In the linen ledger paper process, on the other hand, the paper comes from the machine damp with the size, and in order to allow the size to work thoroughly into the interior of the paper and to secure a better seasoning effect, the paper is allowed to dry by being hung in a loft, which is kept at an even temperature. The paper is hung up, four or five sheets



8.—Loft Drying.

together, in "spurs" on the loft poles (Fig. 8), and about fourteen days are allowed for seasoning.

FINISHING ROOM.—The sheets are next taken to the "jogging room," where they are straightened out and arranged in piles ready for the "finishing room," where they are placed in hydraulic presses and subjected to a pressure of 350 tons. They are left in the press for twelve hours and are then taken to the "calenders," which consist of three or four superimposed rolls, with surfaces made alternately of cotton and iron, between which the sheets are passed for the purpose of imparting the smooth finish characteristic of record paper. In this mill it is the object to secure a uniform finish on both sides which shall be smooth but without having any "greasy" appearance. The paper goes through the rolls five or six times, being passed through sometimes with the wrong and sometimes with the right side up.

Each sheet is then carefully inspected by girls, who hold it up to the light and look at it on both sides to detect any imperfections. Next follows an inspection by the foreman and finally by the superintendent, after which the sheets are counted and put up in reams of 480 sheets each. The edges are then trimmed exactly square, and the paper is tied up in reams and labeled for the market.

Every day specimens of the output are brought to the main office to be tested. The tests are made for writing, erasing and rewriting, finish and color, tensile strength and resistance to tearing. The tensile strength is tested on a special machine by clamping the sheet of paper over a 1½-inch hole and subjecting it to pressure with a 1 inch piston and noting the load under which it gives way. Twenty-four pound folio must stand 75 pounds pressure, 28 pound demy, 90 pounds, and 40 pound medium, 100 pounds pressure. These pressures are almost exceeded before the paper gives way.

As an instance of the remarkable density of the paper and the thoroughness with which the sizing had penetrated its texture, we saw the numerals from 1 to 10 written and erased eight times in succession in the same place on a piece of ledger paper without the ink running or spreading on the erased surface.

In concluding our description of this very complete plant, mention should be made of the motive power, which is illustrated on our front page engraving. It consists at both mills of two vertical Hercules turbines of 150 horse power each, running under a head of 23 feet, and a Corliss engine of 300 horse power. Both turbines and the Corliss engine are belted to a shaft which runs the entire length of the mill. A coupling on this shaft enables the company to use 150 or 300 or 600 horse power according as one or both turbines, or one turbine and the engine, or both turbines and the engine are coupled up.

The plant of the company includes two distinct mills, the Defiance and the Centennial. Each mill is complete in itself, and while the description of the process of manufacture above given refers to the Defiance Mill, it would apply equally well to the Centennial, which is the earlier structure of the two.

7.—Rag Room—Cutting and Assorting.

Some Interesting Inventions.

A barrel is a very awkward thing to handle, even with the trucks which are especially designed for carrying them. An Alabama inventor has devised a truck which consists of a pair of curved gripping jaws, somewhat resembling blacksmith's tongs. The levers operating the jaws form the handles of the truck. In practice the truck is run up to the barrel, and the jaws are clamped around the bottom. A clamp holds the lever arms firmly together until it is desired to release them for unshipping the barrel.

Hunters and campers who have used sleeping-bags find that they are comfortable and keep out wet and dampness, but a Canadian inventor has made what really seems to be a substantial improvement upon sleeping-bags. His invention consists of a rigid frame which is collapsible when not in use, and covered with some material intended to withstand the weather. The whole top can be thrown up by means of hinges. At the upper end of the lid is a small opening which is covered with a similar hinged lid. In cold weather this lid may be closed. In mild weather it may be fastened at any desired point. Ventilation is provided through holes under the projecting edge of the large flap.

One of the most perverse things in the world is a refrigerator cover. It is necessary to have the refrigerator stand well away from the wall in order that the cover may lie back against it when ice is being put into the refrigerator, or articles of food taken out. A Missouri inventor has devised a lid retainer for iceboxes, which permits of having the icebox pushed up against the wall and will hold the lid when it is thrown against the catch. It consists merely of a post extending upwardly from the rear part of the icebox and a detent pivoted to its upper end in such manner as to engage the forward edge of the box lid when it is thrown back.

A novelty is an electric fan worked on the principle of the nickel-in-the slot machine. When it is desired to operate the fan a nickel is dropped into a slot back of the fan, and a refreshing current of air is obtained until a certain predetermined amount of current has been used and the current is cut off. Many persons are deterred from having electric fans owing to the considerable initial expense, and by the fact that they can be used only three or four months of the year. The inventor considers that fans would be more generally used if the breeze could be supplied by expending a small sum.

9.—Finishing, Trimming, and Counting.

MANUFACTURE OF LINEN LEDGER PAPER.

A Case of Triple Personality.

The Pathological Institute of the New York State Hospitals for the Insane (Boston Medical and Surgical Journal, February 23, 1899) has recently reported a case of great scientific interest occurring in the department of the institute devoted to psychology and psychopathology. The case is a remarkable one of amnesia, the patient being a clergyman about twenty-six years old, who fell out of a wagon, and, striking upon his head, became unconscious. When he recovered from the stupor, it was found that he had completely lost his memory and that his personality was lost with it. His mental condition was that of an infant, and in the course of education to which he was subjected he developed a new personality, totally different from the old. He next manifested the phenomena of alternating personality—for instance, falling asleep in his secondary personality and awakening in possession of his primitive personality, and vice versa. Neither personality was at all conscious of the other. The patient thus had two consciousnesses, which he possessed at different times, but between which there was absolutely no communication. The problem was how to unify this double consciousness. This was attempted by preventing him from lapsing into profound slumber, keeping him in a condition between sleeping and waking, and the result proved successful. As a consequence he developed a third personality, which was conscious of the other two personalities, and this finally filled every gap in his memory. Dr. Van Giesen, the director, speaks of the case with satisfaction, and expresses the opinion that it shows an advance in the domain of psychology.

A WRITER in Uhland's Wochenschrift says: Perhaps the first industrial exposition on record was held in 1569 in the Rathhaus of Nuremberg. A catalogue published at the time thus states the purpose of the exposition: "It shall bring before the public all innovations in the trade of the whole world in modern times, together with domestic art-productions."

BRUGSCH BEY has lately described a comic papyrus which is unique. The artist lived in the period of the XXII. Dynasty, and has painted burlesque scenes in which cats and rats conduct themselves like human beings. For instance, a rat attired as a great lady was served by a cat who is clothed as a slave and is presenting a mirror to the mistress.

Life in a Winter Bee Cellar.

BY GEORGE E. WALSH.

When the cold days of October and November chill the air to a freezing temperature, the honey bees go into their winter quarters, and enter upon their long period of hibernation. The mystery of the winter sleep which overtakes so many of our animals, insects, and reptiles is studied to the greatest advantage in a modern bee-cellar, where the little honey gatherers can be examined at leisure in the various stages of somnolence that so closely resembles death. In the last twenty years science has made such revolutions in apiculture that it is possible now to get a glimpse inside of a hive of bees at almost any time without disturbing its inmates.

With the instinct of self-protection the wild bees always built their homes in hollow trees or posts where they could huddle together for mutual warmth when autumn came, but in spite of this the mortality was so great among them that their numbers did not increase rapidly. Some winters they were slain by the thousands and whole swarms would be frozen to death. The farmers who first attempted to cultivate the acquaintance of the bees for the honey they could induce them to raise always expected to lose more than half their colonies in particularly severe winters.

In the North the apiarists generally have large bee-cellars where the little insects are kept through the cold winter months. These cellars are models of sanitary construction, for in its artificial home the honey bee is very susceptible to little diseases that never bothered it in its wild state.

The bee-cellars are constructed so that perfect drainage is obtained, for moisture in a bee-cellar means death to its inmates. Then some simple but effective ventilation system is adopted. The temperature of the cellar must be kept low, just above the freezing point, throughout the winter months. Heat is supplied for very cold weather by hot air or an ordinary stove. A thermometer is always kept in the cellar to see that an even temperature is maintained.

In this cellar the bees are brought from their summer stands as soon as the weather is cool enough to warrant the change. The summer hives are carted to the cellar, and one piled upon another in tiers reaching to the roof. Between each tier there is a small space to permit the owner to reach any particular hive, and between each hive a strip of wood is placed to separate them sufficiently to allow a free circulation of air. It is quite a question of science sometimes to keep the right temperature for all the bees, because the outer hives must of necessity be exposed to cold draughts more than those inside, but the apiarist is supposed to overcome this difficulty by the peculiar arrangement of his heating apparatus, and by additional protection for some of the exposed hives in the shape of a straw covering. A current of cold air is sometimes artificially forced through the cellar.

The temperature of the cellar is so low that the bees are in a semi-hibernating condition all winter. It would not be profitable to the apiarist to raise it so that they would be stirring around, for bees, like all other hibernating creatures, are very hungry when they wake up from their long sleep. In the midwinter thaw, which nearly always visits us in January or February, the weather often becomes so mild that the bees wake up of their own accord, and show a decided propensity to fly about. They imagine that spring has arrived again, and if they have the chance, they fly about. The owner does not discourage this desire for exercise, but approves of it, and gives the insects all possible encouragement. A little flight in the middle of the day gives them fresh air, and enables them to void their intestines, which reduces their chance of serious diseases.

But in this mid winter flight many of the bees sometimes get lost, or, becoming chilled and benumbed, in their return trip to the cellar they drop down in the grass and die. Thus in bee-keeping districts it is not at all uncommon to find bees crawling about in the grass in the middle of winter. It may be concluded for certain that they are from some neighboring hive from which they have strayed too far. Frequently the bees fly about in all directions, apparently looking for flowers, but, not finding any, they return to the hive without having once lighted. It is probable that they have become so disgusted with the country that produces no flowers with nectar in their chalices that they prefer to return to their warm hive, where at least food can be found.

This food given to the bees in the winter is not as desirable as honey. It is generally compounded of cheap glucose, sugar, and water. The bees do not even like pure sugar as well as honey, but they will eat it in the absence of their favorite nectar. Considerable of this food has to be given to the bees in their winter quarters. It is put in the artificial comb, and artificially capped where the bees can reach it when they require it. If this food should give out unexpectedly in the winter, the bees would quickly starve to death unless it were replaced.

The bees cluster together in the hives in their winter quarters like bats hibernating in a cave. They cling so closely together that they look like a big mass of inanimate insects. Occasionally a leg or wing will move to show that they are alive. Those in the center of this swarm are kept very warm by the heat imparted to them from the bodies of the others, and they are frequently the liveliest of the whole lot. They will wriggle and squirm around sometimes so that the whole mass will vibrate. It would seem as if their sleep was a little restless, rendered so probably by a too high temperature.

The bees on the outside of the mass are so far gone in their slumbers that they can be picked up with impunity and examined. There will be no attempt to sting the hand that lifts them unless the warmth from it furnishes them with new life. Their hibernating period ends just as soon as spring begins to warm the air, and then they grow restless and anxious to get out of their winter quarters.

The first consideration is to see if the queen is all right in each hive. Sometimes it is difficult to find the queen in the midst of the newly awakening horde of insects, but it is an easy matter to discover signs which indicate her presence. For instance, if the brood and eggs are numerous and in good condition, he knows that the queen has successfully performed her duty; but if there are no eggs and sealed grubs visible, the colony is in a critical condition, and something must be done very soon. The modern hive with its movable frames and artificial combs enables the apiarist to act quickly, so that a queenless colony may sometimes be strengthened. Going to a colony with a queen and plenty of brood, the apiarist takes out one of the movable frames of brood, and puts it in the hive without a queen. This soon works magic results. The few surviving members of the depleted colony take it upon themselves to hatch out the new brood, with the hope that a new queen can be raised by them. The loss of a queen is so discouraging to a colony of bees that the little insects will lose all ambition, especially in cold weather. In the summer time a queenless colony can receive a new queen by the introduction of a new one by means of the artificial queen cage.

All of the modern devices and improvements in bee culture help to simplify an industry that has taken rapid forward strides in the past quarter of a century.

There is as much science in apiculture to-day as there is in tilling the soil for intensive farming. The bee-keeper is supplied with almost as many implements as the farmer. The hive itself is a wonderful piece of mechanism. The Langstroth hive, ingeniously devised and patented by Dr. Langstroth about thirty years ago, is the foundation for all of the modern hives, which are simply modifications of the original. These hives are manufactured by machinery, and they are so cut and arranged that they can be shipped in sections to any part of the country, at little cost, and then be put together by a boy. They are usually sold in lots of a dozen or more, with the sections cut in single pieces of wood, grooved and creased, so they can be bent around and locked as easily as one would put a picture puzzle together.

The Langstroth hive and frame created the first and probably the greatest revolution in bee-keeping. The movable frame is a device by which the inside of the hive can be removed by sections, and without disturbing the bees in other parts of the hive. Thus the comb honey in one section can be removed, while the bees are scarcely aware of it. The next greatest invention was the centrifugal honey extractor. This extractor enables the apiarist to take from the natural honey comb all of the honey without disturbing or breaking the comb. Then the bees proceed to fill it again with a new crop of honey. Thus the apiarist keeps stimulating the bees to greater effort to fill the combs before the season is over. The comb foundation was another great invention. This foundation saves the bees many hours of work. Broken, dirty, and brood comb can be taken and placed in the hive by means of the comb foundation, so that the bees will make a full one much quicker than if they had to lay the foundations of an entirely new one. The modern method of introducing Italian queen bees in the hives is probably fully as important in its results as some of the foregoing inventions, and it should be classed high among the factors that have brought larger profits to the apiarists in all parts of the country.

The Electricity Building at the Paris Exposition.

The building which will be devoted to the electrical exhibits of the Paris Exposition will be a most remarkable structure. It is so florid and ornate that it resembles no other building ever constructed. It will undoubtedly be the most striking building which is seen on entering the grounds. The façade has a richly ornamented portico, and directly in the middle is an enormous fountain which masks three-quarters of the central part of the facade. It is what is known as a "Chateau d'Eaux," and consists of a deep niche with steps at various levels over which water will flow, and a group of sculpture will terminate it. The building will be made of staff and will be brilliantly treated in color.

Archæological News and Notes.

The great glory of Chesterfield House, London, is a marble staircase, each step of which is formed of a single block of marble more than twenty feet long.

The death is announced of Mr. Charles Edward Drury-Fortnum, who is well known as an antiquarian. In 1888 he presented his splendid collection of plaster and Renaissance art objects to the University of Oxford. He was a great authority on gems, bronzes, and majolica.

An important work is soon to be begun at Spalato, in Dalmatia. This will be the building of a central museum in which the collection at present scattered among four buildings will be brought together, including the objects found at Salona and in the Palace of Diocletian.

The English archæologist, Mr. Phillips, has offered Signor Baccelli, the Italian Minister of Public Instruction, the sum of $12,500 for the carrying out of investigations in the Forum. The money will be largely used in expropriating the houses now standing about the ruins of the Basilica.

The plan for reviving the business in the Palais Royal at Paris is under consideration. If this is done, the quiet of the garden in the center of the buildings will be destroyed and it will be turned into a thoroughfare between the great boulevards and the quarter of the Louvre, thus sweeping away one of the oldest landmarks in Paris.

The architect, M. Redon, who has charge of the Louvre, has resolved to restore the Tuileries Garden to the condition in which it was in the days of La Nôtre. As the palace does not exist to-day, it is impossible to say whether the old artificial style will be more pleasing or not. It is an interesting experiment, however, and well worth trying.

Heinrich Kiepert, probably the greatest authority on the geography of antiquity, recently died at the age of eighty-one years. He was professor at the University of Berlin. His "Atlas of Hellas" began to appear in 1840. His greatest work is his "Map of Asia Minor." He also published a general atlas of the world, which is one of the best modern German atlases.

It is proposed to erect a statue at Vendome, in Touraine, France, of Marshal de Rochambeau, who commanded the French forces serving in the American Revolutionary war. The Historical Society of Philadelphia has subscribed $1,000. It is hoped and proposed that Philadelphia, Boston, and New York each will subscribe $1,000, and that a like sum be raised in France by subscription.

In Paris, May 1 is supposed to be inaugurated by the discharge of the cannon in the Palais Royal, the powder being ignited by the sun. This year, however, the function was delayed several days owing to bad weather. The cannon is of considerable historical importance. According to The English Architect, it was presented in 1786 by Rousseau and was well known to Camille Desmoulins.

Dr. Ernest Steinmann, the well known art writer, has just made some interesting discoveries in the Vatican. The Stanze of the Vatican contain the wonderful frescoes executed by Raphael and by his pupils. Before the great master had demonstrated his wonderful ability by painting the School of Athens, some of the other artists attempted to paint the walls. Remnants of these early paintings have now come to light. They are of no great importance in the history of art, but they suggest that the whole of the walls of the Stanze were covered with a series of paintings which may have helped Raphael or rather given him ideas of the great work which followed. There is considerable conjecture as to this however, as Raphael was too much of an originator to be very much helped by the work of inferior men, although he did not hesitate to assimilate the ideas of the masters of all time.

Students of architecture may have often wondered how the two towers of Nôtre Dame, at Paris, were not of the same size. A writer in one of the English magazines has found a rather curious explanation. It appears that when the cathedral was built it was the cathedral of a suffragan bishop, who was not entitled to two towers of equal height, and for centuries the Bishop of Paris was suffragan to the Bishop of Sens.

Explorations are proceeding rapidly in the Forum, Rome, and following upon the expropriation of the site of the Basilica Æmelia comes the good news that the ugly seventeenth century church of San Lorenzo, in Miranda, which has disfigured the beautiful temple of Antoninus and Faustina, is to be taken away, so that the remains of this imposing temple will now be revealed in all their beauty. The columns are the largest of their kind in Rome, being fifty feet high and ten in number. The three large steps of the portico which descend to the Via Sacra have now been entirely cleared of rubbish, so that not only is the majestic flight of steps which led up to the temple actually seen for the first time for at least fourteen centuries, but the actual width of the Via Sacra in front of it is likewise for the first time actually made known.

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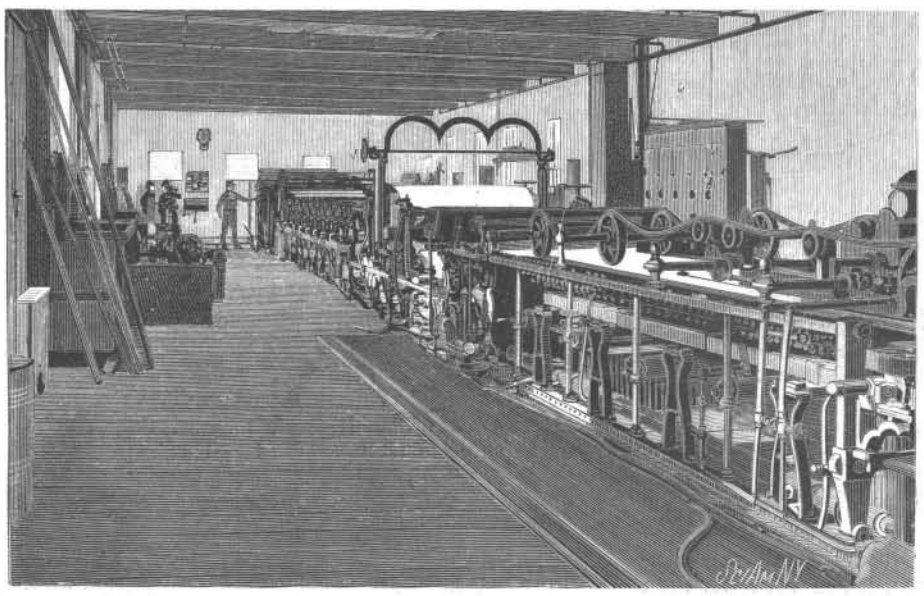
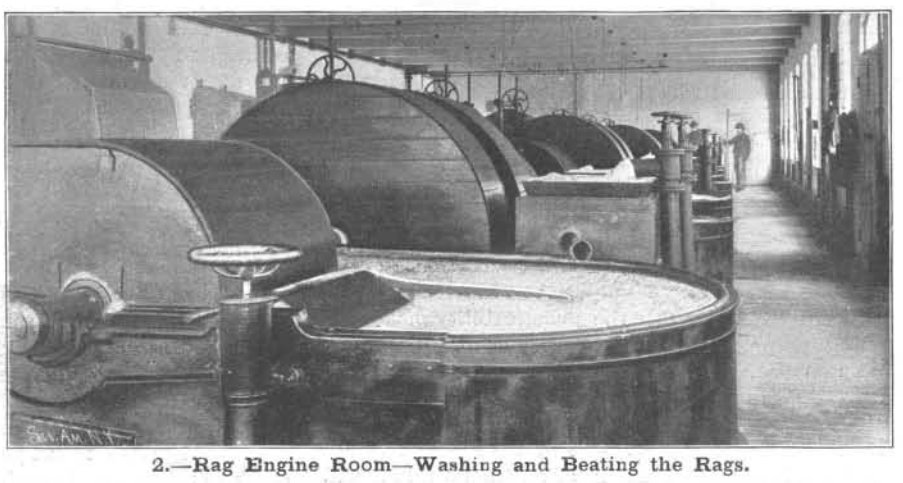
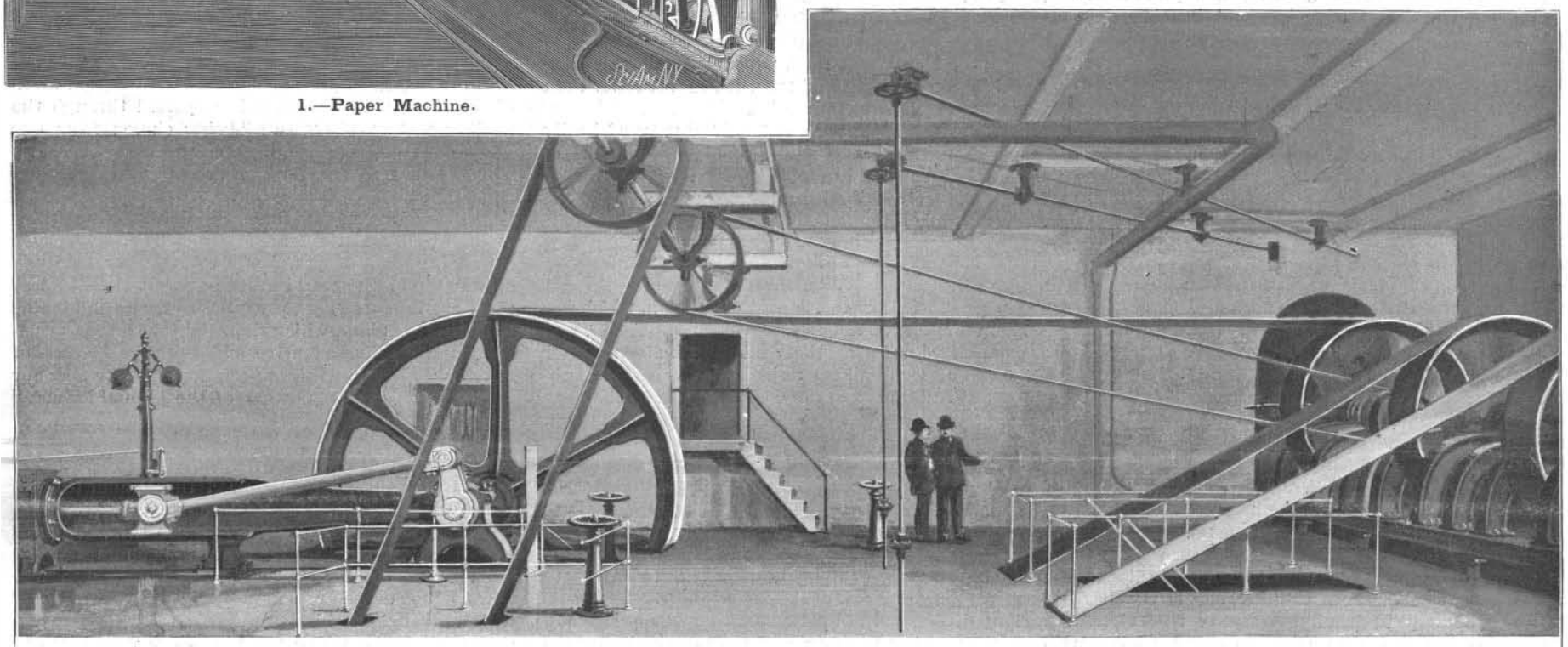


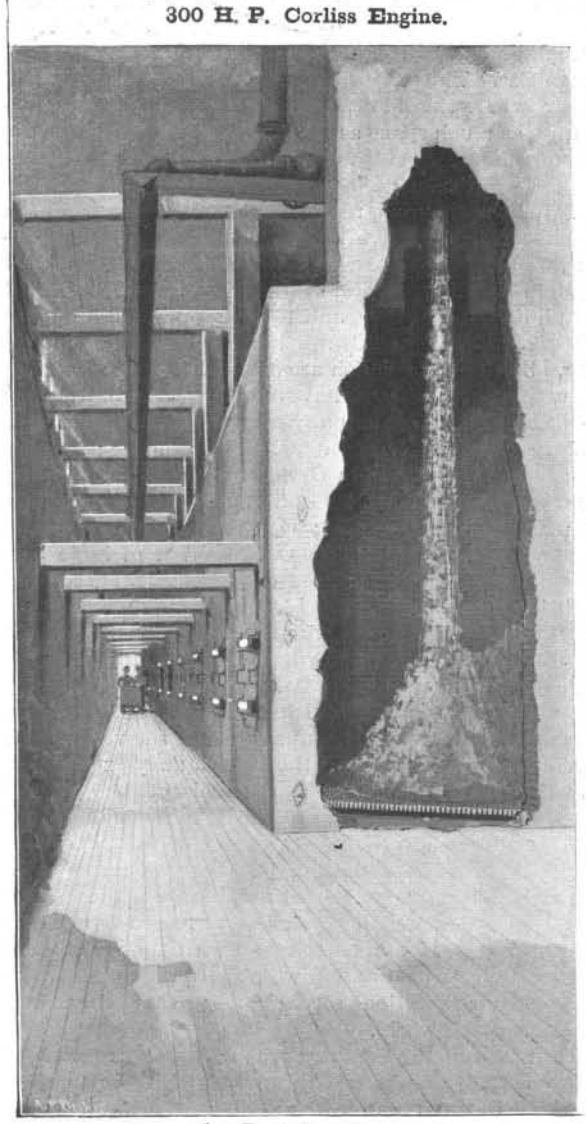
1.—Paper Machine.



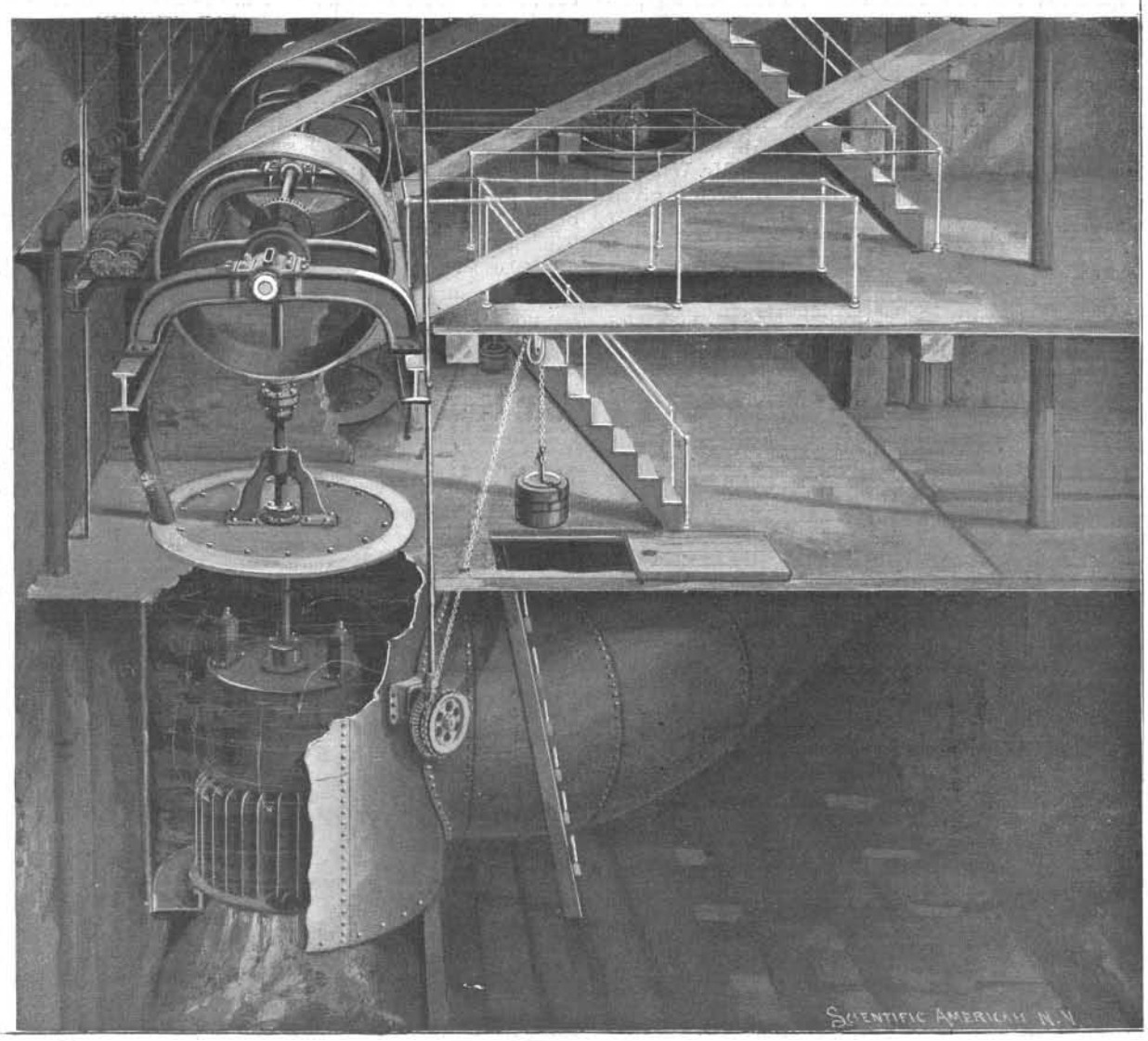
2.—Rag Engine Room—Washing and Beating the Rags.



300 H. P. Corliss Engine.



3.—Draining Room.



Two 150 H. P. Turbines.

MANUFACTURE OF LINEN LEDGER PAPER—PLANT OF THE BYRON WESTON COMPANY.—[See page 378.]