HANDLING THE GRAIN CROP AT THE PORT OF NEW YORK.

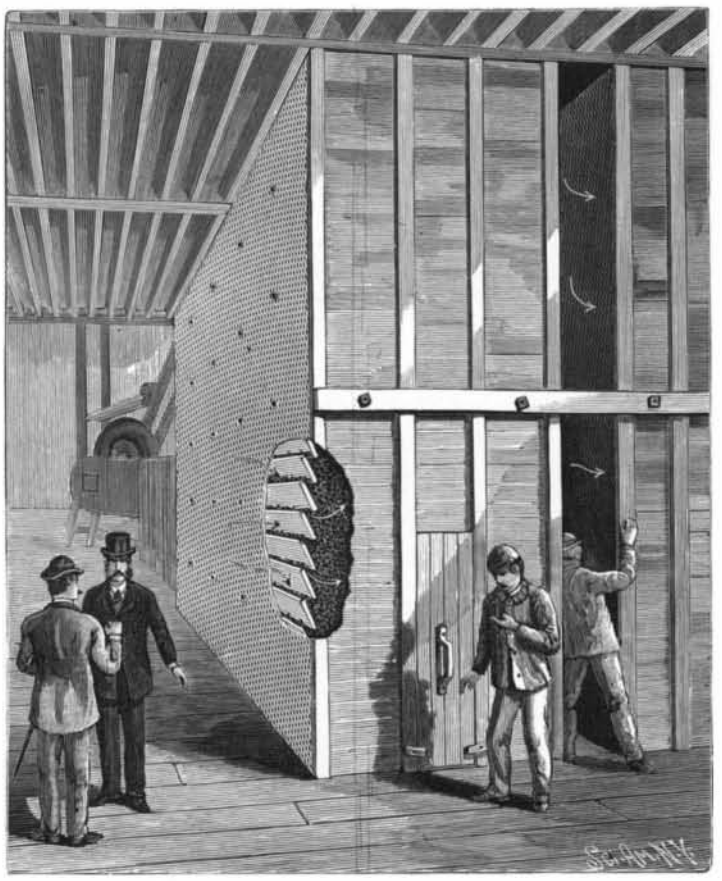
The phenomenal wheat crop for the year 1897, estimated at about 500,000,000 bushels, has not only lifted a burden from the shoulders of the farmer, but it has produced an unwonted activity on all the various systems of transportation by rail, river, canal or ocean. It is not often that Nature has dealt so kindly with this country as she has this year; for the season of propitious rains and sunshine which has favored the wheat fields of America has seen the crops of Europe blighted by one of the most disastrous seasons in the history of that continent. In Argentina and India, moreover, the crops have been light; and, while the American farmer will regret the disappointment and hardship which must follow a crop failure in those countries, having felt something of the bitterness of it himself in other years, he will naturally rejoice in the bettered circumstances in which this year's plenty has placed him.

It is estimated that over 200,000,000 bushels of our wheat will be required by the Old World, and it can well be understood that the shipment of this vast bulk will materially improve the finances of the various transportation companies that carry it from the interior points to the seaboard and across the ocean to the countries of the Old World.

Among all the great shipping ports for the export of grain, New York holds a commanding lead, as will be seen from the fact that, out of a total export from the United States of 155,107,091 bushels of wheat in 1896, the shipment from New York was 42,662,125 bushels, or over one-fourth of the whole. In the year 1892, when the crop was unusually heavy and the total export of wheat from all ports was 203,857,650 bushels, the export from New York was 75,363,965 bushels, or over one-third of the total. The cheapest route from the Western wheat farms to New York is by way of the Great Lakes and Buffalo. The wheat is hauled by the farmers direct from the thrashing machines to the small elevators which line the various railroads of the far West and form a conspicuous feature of the landscape. From these it is loaded into box cars and hauled to the great distributing points on the lakes, such as Chicago and Duluth. Here the bulk of it is transferred to steamers which have been specially built for the grain carrying trade. There are at present seven hundred vessels engaged in this trade on the Great Lakes. Those of later construction have a carrying capacity of over 100,000 bushels, and the largest of them is credited with a capacity of 180,000 bushels.

At Buffalo, which, by reason of its advantageous location, has grown to be one of the largest grain ports in the world, the wheat is stored in the mammoth elevators which line the harbor, and from these it is drawn off for shipment to the various Atlantic ports. From Buffalo the wheat is brought to New York either by rail or by the Erie Canal. In former years the wheat was brought to New York during the summer, chiefly by the canal, but latterly, and especially during the present year, the bulk of it has been shipped by rail. Statistics of the total amount of all cereals, wheat, corn, oats, barley, etc., brought to the New York market show that, out of a total of 150,827,120 bushels received in 1896 at this port, 78·07 per cent came in by rail and 21·93 per cent by water. Among the railroads, the Hudson River Railroad carried 22 per cent, the Erie Railroad 17·4 per cent, and the West Shore and the Lehigh Valley roads each carried about 14½ per cent. Of that which came by water, 0·37 per cent was brought down from points on the Hudson River or came in by coasting vessels, and 21·56 per cent was brought by the Erie Canal.

The wheat which eaches New York by rail is transferred to the great elevators at the terminals of the roads on the Jersey City side of the Hudson River. The train of cars is run through the center of the house, and elevators carry the wheat from the cars to the roof, where it is weighed (a carload at one weighing) and is run direct by conveyors and chutes into lighters which are moored in the docks alongside the building. These lighters will carry from 8,000 to 30,000 bushels apiece. The loaded lighters are then towed to their destination. If the wheat is to be stored, the lighters are taken over to the great Brooklyn warehouses, the largest of which, Dow's stores, is shown in the accompanying illustrations. If the wheat is to be shipped to Europe, the lighters are towed alongside the ocean steamer at whatever dock it may chance to be loading, and the wheat is transferred directly to the steamer's hold by means of what are known as floating elevators, of the type shown in Fig. 8. This is nothing more nor less than a steam vessel equipped with a complete elevator system, including weighing hoppers, screens, cleaners and elevator legs. The engine and boilers are placed in the stern of the boat and the elevator machinery amidships. In the elevator shown in Fig. 8 the latter is in duplicate, enabling the elevator to unload two lighters at a time. Extending from each side of the tower, and pivotally connected to it, is a leg containing an endless belt on which are fastened scoop buckets. The top pulley is driven by chain and sprocket gear from a vertical shaft within the tower. The legs are lowered into the hold of the lighter, and as the belt travels round the lower pulley its buckets scoop or "eat" up the grain, carrying it to the top of the legs, from which it falls through chutes into the weighing hoppers. If the grain is to be cleaned, it is carried up by a short bucket elevator and passed through a shaking screen, where the coarser foreign bodies are removed, as will be explanied later in the present article. From the screen it passes through the suction cleaning works, where all the chaff and finer refuse are removed. It then falls to the bottom of the "ship elevator," in the hold of the vessel, whence another endless bucket belt carries it to the top of the tower and empties it into long telescopic pipes through which it passes to the hold of the steamer. If the wheat is not to be cleaned, it is taken from the lighters and run directly to the foot of the ship elevators and discharged by them to the steamer.



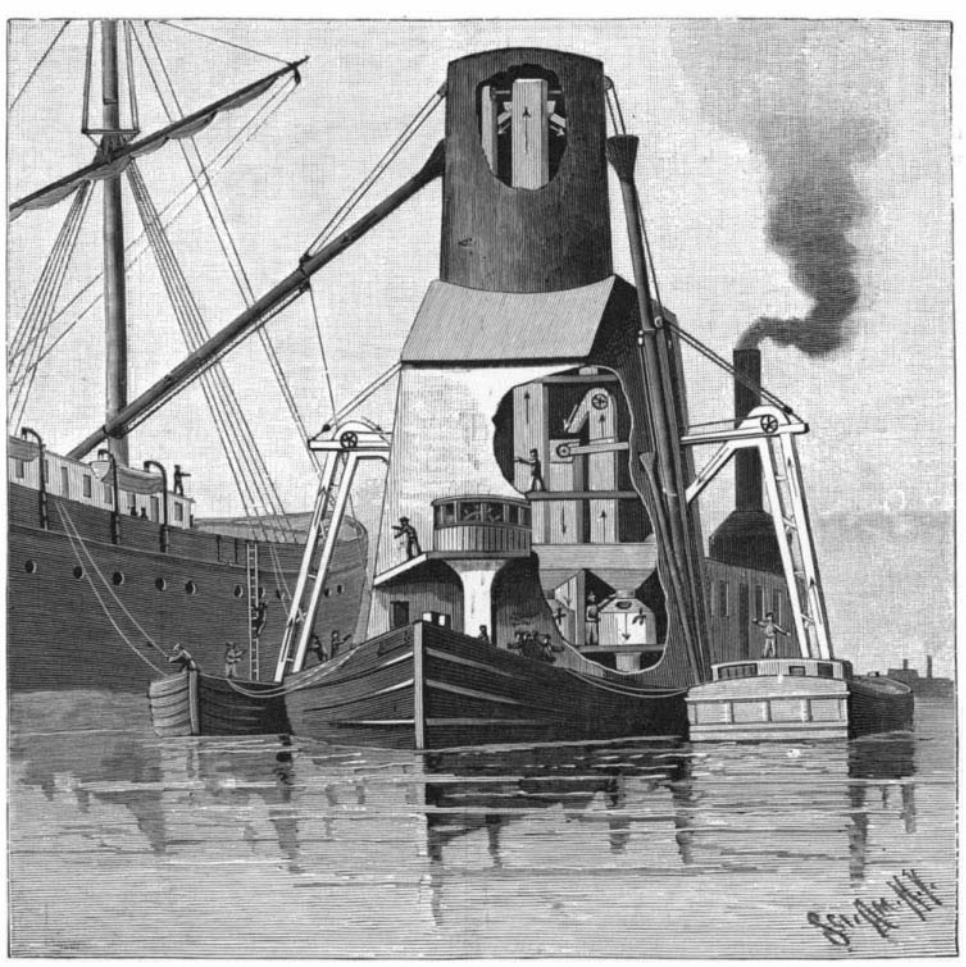
7.—GRAIN COOLERS.

The floating elevator has proved of incalculable value in reducing the time and cost of transshipping the grain; inasmuch as the deep sea craft do not require to be brought to the dock elevators, but may be loaded at any dock along the many miles of New York water front. The International Elevator Company, to whom we are indebted for assistance in the preparation of this article, possess seventeen of these elevators in all, six of which are of the double and eleven of the single type. The single elevators have a capacity of 6,000 bushels per hour, and as an instance of the rapid work that can be done by this system, it may be mentioned that two or three floating elevators working on each side of a great ship like the Pennsylvania could put 30,000 bushels per hour in her hold.

The wheat that is not shipped to Europe immediately upon arrival at New York is stored in one or other of the great elevators, the largest and most notable of which are at Dows' stores and Columbia stores, in Brooklyn, owned by the Brooklyn Wharf and Warehouse Company. The combined capacity of the two is about 3,500,000 bushels. Dows' stores, of which, by the courtesy of the company, we are enabled to give illustrations, is a vast structure, 100 feet in width, 1,200 feet long and 175 in height from the dock level to the top of the towers The main building at the inshore end is 100 feet in width by 600 feet long, with three great towers in which are contained the lofters (vertical elevators), weighing hoppers, cleaners, coolers, and a large system of inclined spouts for delivering the grain to the various storage bins.

In the main building below the towers are the storage bins. These are formed by dividing the space into a vast number of vertical cells or pockets, each 12 feet square by 52 feet deep, by means of wooden walls. The latter are built up of 2 inch plank, laid sidewise and spiked together, the lower half of the walls being 8 inches and the upper half 4½ thick. Each bin will hold 6,000 bushels, and if it were necessary over 2,200,000 bushels could be stored in this building at one time. Extending for 600 feet from the main building toward the river is an elevated gallery two stories in height carried upon trestle bents, and midway of its length is a seven storied building in which is a set of elevating and cleaning machinery similar to that in the towers above the main building. From each side of this building a large adjustable elevator leg projects over the edge of the adjoining dock.

It would be simply impossible to give within the limits of this article a detailed description of the operation of this great establishment, but it will be sufficient to trace the course of a ship load of wheat which has been brought to New York, let us suppose by canal boat, through the Erie Canal, and has been towed over to Brooklyn for storage in the warehouse. As soon as the boat has been made fast, the hatches are removed and the large elevator leg is lowered down until its mouth is buried in the heap of grain. The leg (see Fig. 2) consists of two approximately parallel square pipes, braced together to stiffen them, which serve to inclose an endless rubber and canvas belt on which buckets are attached at intervals of a foot. The belt passes over a pulley at each end of the leg, the upper pulley being inclosed except on the side nearest the building, where the casing opens into a chute leading to the inside of the house. The lower pulley is cased in on the sides but is open at the bottom, so that when the leg is lowered into the mass of wheat each bucket, as it passes round, scoops up a full load and carries it up the leg. The voracity of such an elevator is enormous, and when it is run at full capacity it will "eat up" 8,000 bushels in an hour. To accommodate the decreasing level of the wheat in the hold the leg is hung in a yoke which is raised and lowered by powerful hoisting gear in the house. This change in level necessitates the employment of the adjustable belt drive shown at the head of the leg (Fig. 2), where the



8.—FLOATING ELEVATOR TRANSFERRING GRAIN FROM TWO LIGHTERS.

belt passes round two idlers and in over a pulley which operates the belt by means of a spur wheel and pinion.

From the top of the elevator leg the wheat is discharged into a large hopper above the scales. From this it is let fall by the operator into scales (Fig. 4), which weigh 160 bushels, or 9,600 pounds, at a time. This is done very expeditiously, only a brief interval being required from the time the lever, which opens the bottom valve of the hopper, is pulled to the time the scales are full. So expert are the operators that each 160 bushels is weighed with the greatest nicety. If the wheat has been previously cleaned, it is not cleaned at the stores, but is transferred at once to the bins. If it is to be cleaned, it is dropped from the weighing scales to the bottom of a short lofter or vertical elevator and carried up to the cleaning room. Here it falls upon the upper end of large inclined shaking screws, Fig. 3, where all the larger rubbish which may have become mixed with the wheat in transit is taken out. This rubbish consists of small sticks, twigs, leaves, fragments of coal, etc. The refuse passes over the screen and falls over the lower edge. The wheat falls into a vertical chute oblong in cross section, from the bottom of which it falls in a thin stream about ½ inch wide and 14 feet long. A strong current of air which is drawn across the stream of falling wheat by means of a fan serves to carry away all the dust, chaff, shriveled wheat cockles, weevils and finer rubbish which was not caught on the screens. The wheat now falls onto long belt conveyors which extend throughout the whole length of the building and are kept continually in motion. There are six lines of these belts in the gallery and six in the main store. They are made of fourply canvas and rubber and all of them are 30 inches in width. Their weight is carried on cylindrical rollers which extend the full width of the belt.

At the point where the wheat falls onto the belt the edges of the latter are turned up more acutely by a pair of rollers, one under each side. The object of this is to keep the stream of wheat from being scattered by the belt before its inertia is overcome. When the wheat reaches the long lofter by which it is to be taken to the top of the tower, it is discharged from the belt by a "tripper." This is a movable frame which runs on a track beneath the belt and carries two rollers, the upper one of which is a few feet above the level of the belt, the other being at the belt level. The belt rises with a gradual curve and passes over the upper roller and vertically down beneath the lower roller. The sudden change in direction of the belt causes the wheat to be thrown clear of the belt into a hopper, whichleadsit to the foot of a long lofter. The latter carries it to the top of the tower, where it is delivered into a hopper. From the hopper it falls by gravity to one of a number of universal distributing spouts, Fig. 5, situated just above the bins. This spout is swivel jointed and may be swung round to connect with any one of eight different spouts which lead to as many different bins, each spout carrying the number of the bin that it serves. So complete is this system that the wheat carried up by each lofter can be directed to any one of one hundred and fifty-two different stations. A part of the spouts will be noticed in the engraving, leading down from the towers through the roof of the main building.

It frequently happens that a body of grain becomes heated spontaneously, and means have to be taken to cool it to a normal temperature. It is at once drawn off from the bottom of the bin and carried by the belt conveyor to a lofter, by which it is taken up to one of the cooling rooms, which are situated in the towers above the main building. The cooler is built in units, any one of which consists of a deep and long, but narrow, box which reaches from floor to ceiling of the cooling room (Fig. 7) and is divided by two vertical partitions into three narrow compartments each 16 inches in width. The side walls and partitions consist of overlapping horizontal slats, which are arranged similarly to the slats of a Venetian blind and slope inwardly. On the outside of the slats is a wire screen. The top, bottom and ends of the cooler are closed and airtight, and the middle compartment is connected with a powerful fan. The heated grain is run into the two outer compartments, the fan is started and a strong current of cold air is drawn in through the wall of grain in each compartment until it has been cooled to normal temperature. The grain is then returned to its bin or loaded onto the steamer as desired.

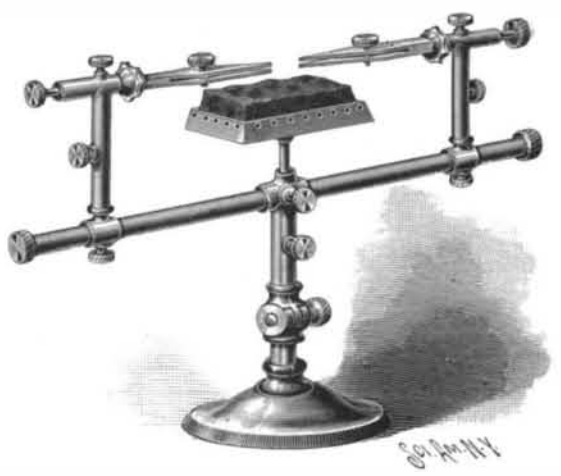
By reference to the large engraving of Dows' stores, it will be seen that at the level of the lower floor of the bridge gallery and at the middle height of the main building there is a long row of delivery spouts. There is a similar row on the other side of the building, and each of these may be used for transferring the grain to the ocean steamers. The wheat is drawn off at the bottom of the bins, carried by a short lofter to the conveyor belts, and by them transferred to the spout at which it is to be delivered. Here it is thrown off the main belt by a tripper, as already described, into a chute which delivers it to the spout leading to the hold of the steamer. When it is remembered that the building has 1,000 feet of wharfage front on each side of it, it can be seen that three or four large vessels could be loaded at once at these stores. It need scarcely be stated that such an establishment as this is capable of handling a vast amount of wheat in the year, the total having risen in some years to as high as 16,000,000 bushels.

Canadian North Pole Expedition.

Capt. Bernier, of Quebec, intends to try to make a trip to the North Pole, starting March 1, in the "Windward," which was used by the Jackson-Harmsworth expedition, from some point on the north coast of Siberia. He intends to take with him a geologist, a surgeon and five men. He expects to send the "Windward" back from Siberia after disembarking his outfit, as he intends to return to Spitzbergen, where supplies will await him. He will be provisioned for two and one-half years. He intends to travel at the rate of six miles a day, making the journey to the pole in 120 days. He expects to travel with dogs and reindeer, especially the latter, on account of their meat as well as their service. Information is not forthcoming as to how he proposes to feed his reindeer on the trip over the ice. Dogs have not been found to be extremely valuable adjuncts of a sledging journey over such ice as that which Dr. Nansen encountered. Reindeer would be far less serviceable than dogs. March seems to be a very early season for a start on an expedition of this kind, as there is little probability that Capt. Bernier could get through into the Kara Sea before early in the summer.

A UNIVERSALLY ADJUSTABLE JEWELER'S CLAMP.

To hold jewelry and similar articles while being operated upon, the clamp shown in the illustration, in connection with which is employed a charcoal pan or heating apparatus, has been invented and patented by Fred J. Thomas, of Cairo, Ill. Upon a suitable standard is pivoted a hollow pin, which may be rigidly held in any position by a set screw, and turning on the pin is a sleeve, also adjustable to desired position by a set



THOMAS' JEWELER'S CLAMP.

screw, while in the upper end of the sleeve is rigidly carried a horizontal beam, passing vertically through which and into the hollow pin is the stem of the charcoal pan, also held at the desired height by a set screw. At each end of the beam is an adjustable standard carrying an adjustable sleeve at the upper end of which is a horizontal head which receives a slidable rod with whose inner end is connected spring fingers projecting over the charcoal pan and adapted to hold the work in any desired position. The clamping portion of the device may, if desired, be removed from the standard and a horizontal arm adjusted thereon, to support a glue pot, etc., over an alcohol lamp, the device being adjustable to a great number of positions and having a great number of different uses.

Acetylene for Military Signaling.

In conjunction with Captain J. E. S. Moore, Mr. A. E. Munby has been making some experiments on the use of acetylene in signaling lamps, says The Progressive Age. They have obtained such good results with the very primitive apparatus at present employed, the light is so brilliant, and the requirements so portable that it seems well worth considering whether acetylene could not take the place of the lime light where portability is an object. From a communication by Mr. Munby we learn that the apparatus consists of a five-ounce bottle carrying a two-hole rubber cork. Water drips on to the carbide from a wide glass tube, holding some two and a half ounces, and furnished with a connection of rubber tube and a screw clamp to act as regulator. The gas escapes from a straight tube to the lamp, being trapped on the way by a wider piece of tube, into which the smaller tubes are corked at each end. This makes a sufficient condenser for any water vapor. The gas tube enters the lamp through the base, and the gas burns from an ordinary 0000 Bray. The generator, when charged, weighs one pound, and after a couple of minutes, during which time the action is a little irregular, will give a steady light for thirty or forty minutes. On more than one occasion, indeed, it has run out without the clamp being touched after first adjustment. He finds an ordinary lamp small for the heat produced, and has had to rivet the soldered parts; but increased ventilation would be easy to arrange. Of course, for permanent work, the generator would have to be arranged in metal. Even then it would probably be the lightest gas-supplying arrangement for the illumination yet produced.

Miscellaneous Notes and Receipts.

Wine from Leaves.—A French druggist has conceived the idea that the flavor of the fruits of shrubs and trees is generated in the flowers of these plants and passes from them into the fruits. The fragrance which the leaves of the black currant bush give off, especially after a little rubbing, and which is so very similar to the taste of the berry, has led the man to adopt this opinion. He goes further, and says that the pleasant taste of the apple, pear, or grape is prepared in the leaves of the respective plants, although he admits that it is hardly noticeable with these, and by far not in the same degree as with the black currant. But this does not discourage the inventor. He sees glycoside, which he proposes to decompose in sugar, or a more or less aromatic principle, as he sets forth in the Union Pharmaceutique. The respective leaves are to be crushed and a fermenting agent, such as yeast, is added to them, whereupon the odorless and tasteless glycoside decomposes and the chemical principle becomes free which is to impart to the fruit proper its aroma and pleasant taste. What was formerly sought to be accomplished with apples, pears, grapes, etc., is now done in a simpler manner with the leaves of these plants in the fermenting vat. Jacquemin, for this is the name of the inventor, places, e. g., apple tree leaves in water containing 15 per cent of sugar; then he adds the yeast. During the process of fermentation there is an odor of apples, and when the fermentation is finished and the yeast has settled, a straw yellow liquid is obtained which possesses the fine "bouquet" of the fruit of the respective trees from which the leaves were taken. With vine leaves the results are still more prolific. A beverage tasting and smelling strongly of wine is obtained, and finally brandy may be distilled from it which is similar to the best cognac!

Changing the Bed of the River Scheldt.—In Antwerp it is hoped that the plan long nourished in influential circles to connect the Rhine with the Scheldt by a canal may at last be realized. Such a new waterway would tend to increase international trade considerably. It is thought in Antwerp that a favorable moment has come to take the enterprise seriously in hand, because Kaiser Wilhelm is advocating the connection of all German rivers with the Rhine. The Belgian government and the city of Antwerp are now confronted with two projects from which to choose. One plan is to extend the harbor works and to broaden the present river bed. Another plan proposes to cut off the large angle which the Scheldt describes below Antwerp by a new bed, whereby the channel receives the proper breadth and necessary depth. This would do away with the north citadel, whose place would be taken by new harbor works.

Fixing Leather to Metal.—In order to fix leather to metal, the Maschinenbauer gives the following directions: Digest 1 part (weight) coarsely crushed gall nuts with 8 parts (weight) of distilled water about six hours and filter through linen. Then pour 1 part (weight) of cold water over 1 part (weight) glue, leave it stand for twenty-four hours and heat the whole, whereby a concentrated glue solution is obtained. Now coat the leather with the warm gall nut extract, bring the glue solution on the roughened and warmed metal, lay the leather on it, press it firmly, and allow to dry in the air. The leather will adhere so firmly to the metal that it cannot be separated without tearing it.

Manufacture of White Opaque Colors by the Use of Tungstates.—Those tungstates which are slightly soluble or insoluble in water and give no colored sulphides with hydrogen sulphide, preferably the tungstates of the earthy alkalies, are now employed in Germany as oil, size and water colors. Especially tungstate of lime and tungstate of zinc are recommended as white opaque pigments. The various tungstates of the same metal (e. g., calcium) behave alike and their quality as white opaque color is not affected by their different percentage of water. Tungstate of lime possesses the covering power of white lead, but remains white to sulphide of hydrogen and similar substances, while white lead turns brown. These tungstates can be used as size colors and water colors, another advantage over white lead.

Waterproof and Fireproof Wood.—In order to render wood waterproof and fireproof, the following "silicification" process is made use of according to the Gewerbe. The small boards are first laid into a waterglass solution of 5° to 10° Be. where they are left 10 to 12 hours, when they are taken out and allowed to drip off. After drying, they are placed in a solution (gravity 2° to 3° Bé.) of calcium chloride, magnesium chloride and ammonium chloride. In this they are left 4 to 6 hours, and after dripping off and drying again, they are ready for use.

SCIENTIFIC AMERICAN

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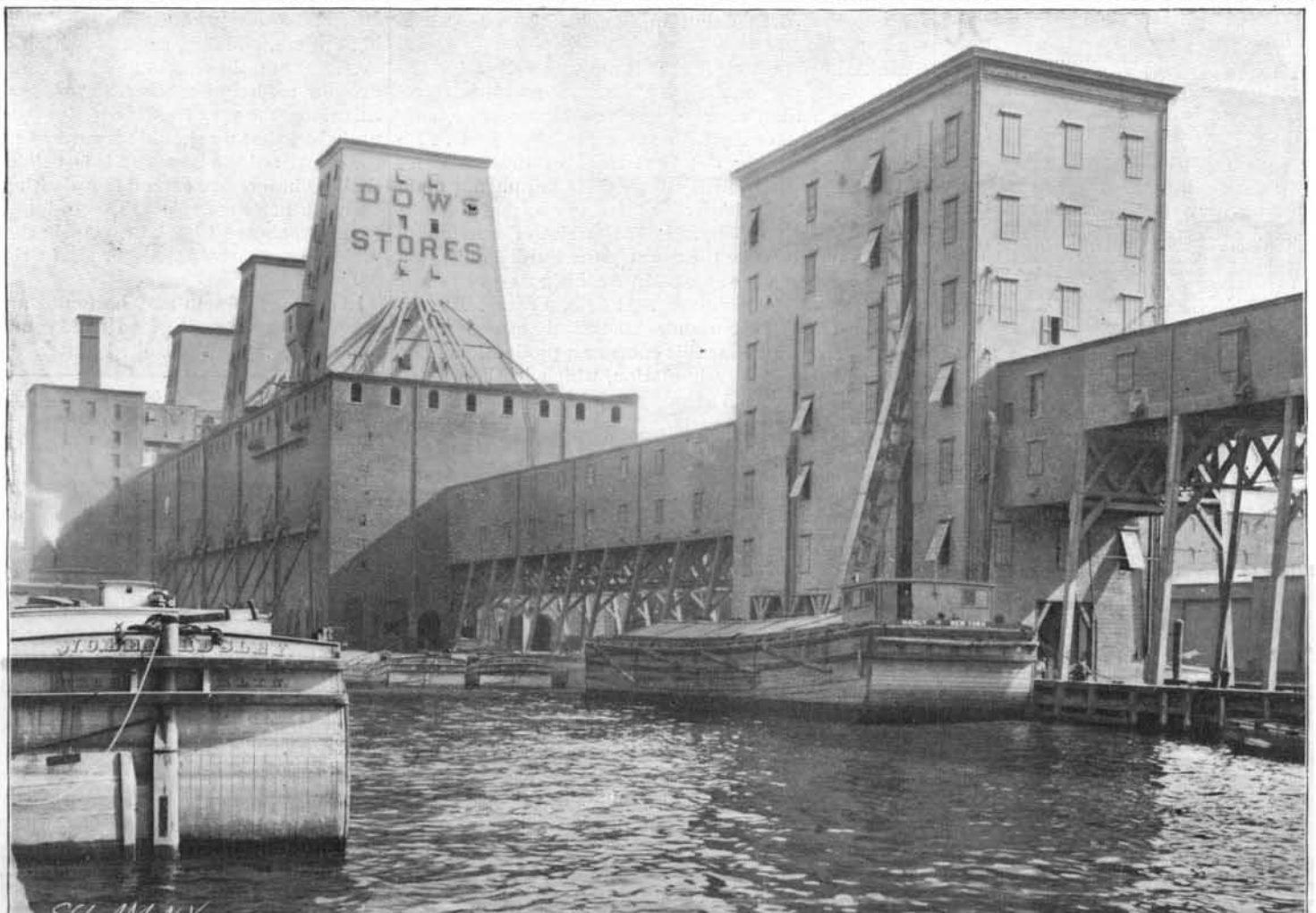
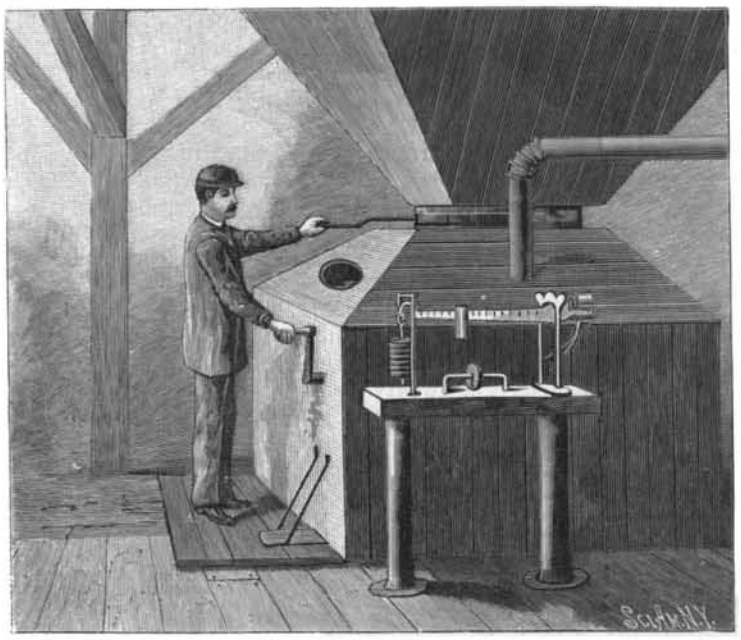
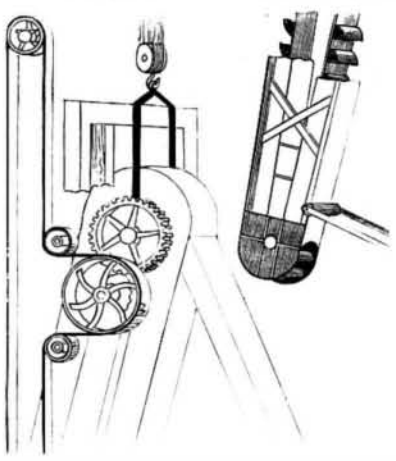


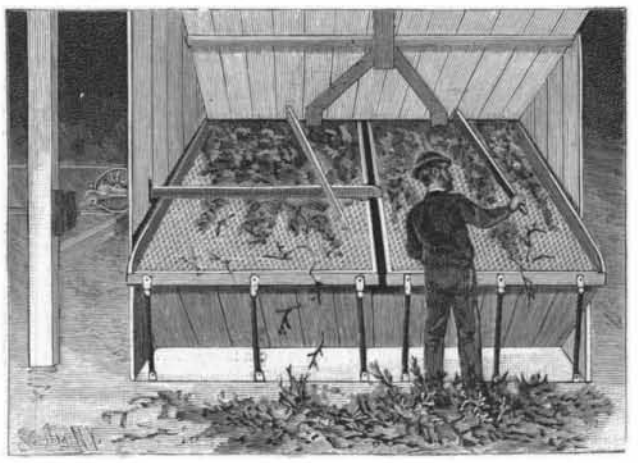
GRAIN ELEVATORS AND STORAGE WAREHOUSES AT BROOKLYN—CAPACITY 2,200,000 BUSHELS.



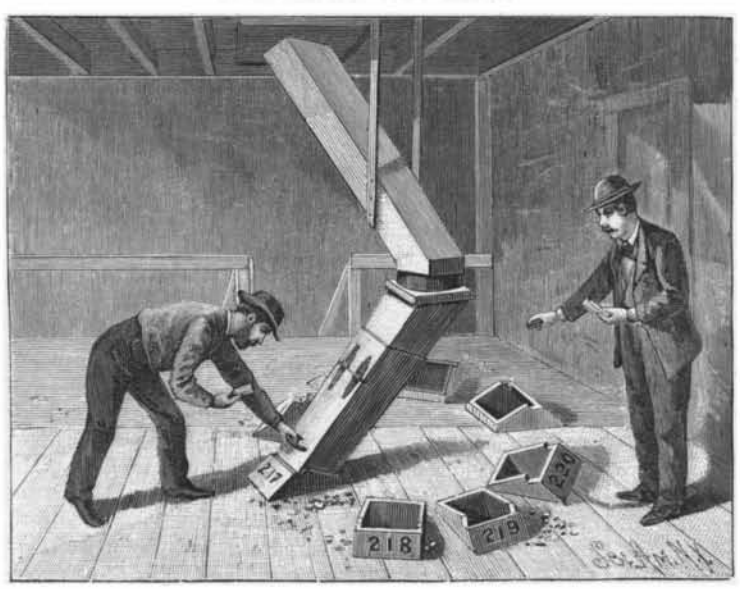
4.—WEIGHING THE GRAIN.



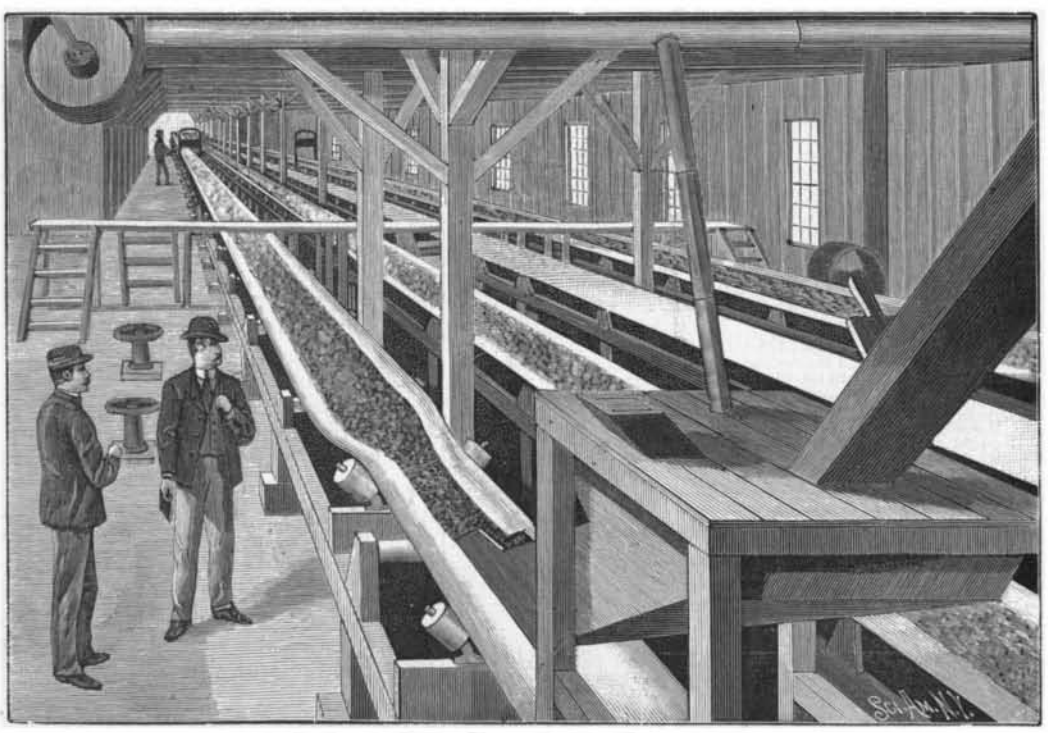
2.—DETAILS OF ELEVATOR LEG.



3.—SHAKING SCREEN FOR CLEANING THE WHEAT.



5.—UNIVERSAL DISTRIBUTING SPOUT.



6.—BELT CONVEYORS IN THE LOWER GALLERY.

HANDLING THE GRAIN CROP AT THE PORT OF NEW YORK.—[See page 325.]