EVOLUTION OF THE CALIFORNIA CLAM-SHELL DREDGER.

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The dredger is an important factor in California's industrial development, creating new harbors, making unnavigable streams navigable, and reclaiming thousands of acres of swamp and overflow lands to the uses of agriculture.

Of the two principal types the suction dredger is used in harbor work, while the clam-shell dredger is found to be especially adapted to river and reclamation work.

While the suction dredger is a rapid worker, it has been found to be unsuccessful for levee or embankment work, as it delivers the material in a highly diluted state, and this is then liable to slough off. The clam-shell dredger, however, brings up its loosened earth in almost solid form and may be made to place it in the exact spot desired. In this way the embankment may be built up solidly, as the work goes along, with no waste of labor or material.

It has been estimated that the original swamp and overflow lands of California, located principally in the Sacramento and San Joaquin valleys, aggregate not less than a million and a half acres. Part of this ground, delta lands, is subject to daily tidal overflow, some to freshet overflow, and some to both. As the State is taking active steps toward the permanent reclamation of great tracts of this land, it is expected that the clam-shell dredger will be more in demand than ever. Even at the present no less than fifty machines are in constant operation.

The old-style levee was for various reasons built close to the channel by the old "wheelbarrow and scraper" method. It was also narrow and was constructed with an abrupt slope, both inland and on the water front. Time proved that this was not a wise course to pursue. The wash caused by the passing steamers was much more effective in breaking down the embankment than if the slope had been more gradual. This manner of dike was also found less able to withstand the force of flood waters; so the conformation of the California levee has been greatly modified as the years have passed and with the evolution of the clam-shell dredger.

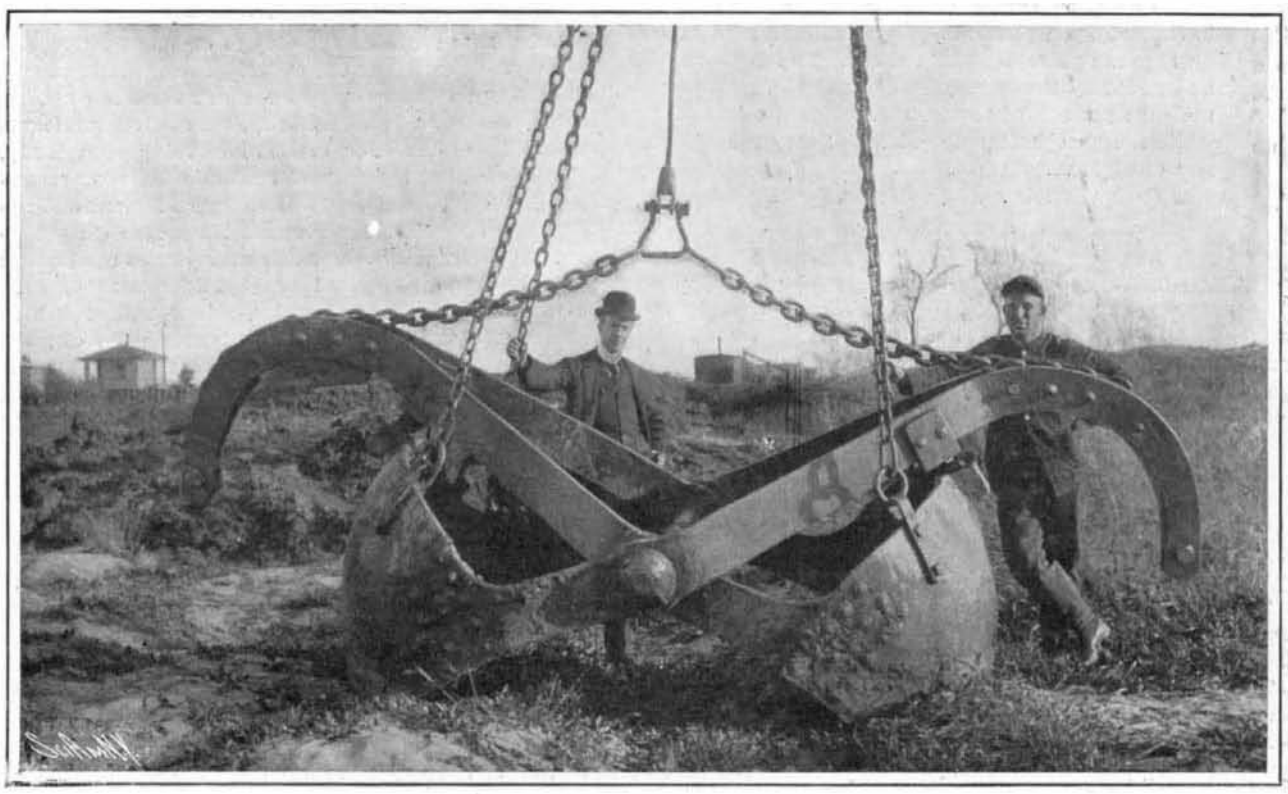
The old-style clam-shell dredger was known as the turn-table dredger. The turntable was secured to a mast, and was operated with a winding drum, the turntable having two projecting arms, which spanned the boom about one-fourth of the distance from the pivot. It was also operated by a chain lift to the bucket with a compound set of hoisting blocks. The present-day or new-style dredger is operated with steel wires, which lead directly from the winding drums to the end of the boom, thence to the bucket, connected direct, without any blocks. This gives a better control of the boom, the pull from the end giving an increased leverage.

The old-style clam-shell dredger had a single frame forward, with only one center back leg, while the new-style one has a double set of forward legs and two legs to stern corners of the hull, thereby preventing the stern of the hull from coming up during the process of lifting.

The buckets of the old clam-shell dredger were of plate steel, hammered to the shape of clam-shells, with forged iron arms. The bucket of the present-day dredger is made of cast steel, with forged-steel arms. The shapes have been made the subject of long and profound study, and have been so designed as to give the best results in digging in hard material. The bucket at present in use will take out material that the old-style bucket would make but little impression upon. It has a maximum holding capacity of eight cubic yards of material. A machine of this capacity will handle from 3,000 to 4,000 cubic yards in a day of twenty-four hours.

In the day of the old-style dredger the levees were still steep and close to the channels, so that the booms seldom exceeded 90 feet in length. To-day, however, with the gradually sloping embankment, the booms in use are 125 to 150 feet long.

One of the larger type, now building, is a machine that will be provided with three-yard buckets and operated by a 140-foot boom. Each of these machines costs from $45,000 to $55,000, according to the character of the equipment.



The New Clam-Shell Dredger Open.

The Dredger Closed.

THE MAKING OF A FELT HAT.

Generally speaking, felt is made from wool, hair, fur, or mixtures of these, by rolling, beating, and the application of pressure, often with the use of acid. The felting property of these substances is due to the fact that the fibers are rough in one direction only, for which reason they can glide among each other in such a way that, when the mass is agitated, the anterior extremities slide forward in advance of the body or posterior half of the hair and serve to entangle and compact the entire mass together. While considerable machinery has been invented and is used to a large extent in many felting processes, especially in the making of hats, skilled hand labor is still very commonly employed in many of the operations of the manufacture, though it must be admitted that the mechanical is constantly encroaching upon the territory of the manual, and it is now almost possible to make felt hats exclusively by machinery.

Many of the present-day uses of felt are beyond the scope of this article, which deals solely with the manufacture of felt hats—the ubiquitous derby and the tourist or Alpine hat. For this purpose, to-day, fur is almost exclusively used, the low price of this article almost entirely obviating the employment of wool even in the common and medium grades. Vegetable matter, with the exception of a little cotton thread or the backing for satin linings, has never been utilized in the manufacture. The furs most generally used are those of the coney, hare, nutria, muskrat, and beaver, in their various grades. The felting quality of the fur is affected by a number of considerations. That of newly-cut fur is inferior to that of fur which has been allowed to stand for some time. Acidulated water causes an increase in the shrinking power, while fatty substances have a contrary effect. The season of the year in which the animal is killed is also an important factor. The initial preparation of the furs for felting purposes is often a separate industry carried on by the so-called hatters' fur cutters, who deliver the prepared fur to the hat manufacturers, sometimes already mixed and blended, according to the quality of the hat required. The preparatory processes include washing and removing projecting hairs by plucking or shearing. The fur then undergoes a process called "carroting," an artificial method of increasing the felting property by chemical means, nitrate of mercury being utilized to roughen the fiber and raise the points of the scales. In the manufacture of hats a mixture of two parts of carroted to one of uncarroted fur is usually employed. After the carroting and a subsequent drying process the fur is cut from the pelt by machinery, the pelt being at the same time sliced into strips and used in the manufacture of glue and gelatine.

The first step in the hat factory proper is to further cleanse the fur by the removal of all foreign substances, including stray hairs, which the preceding processes have failed to eliminate. To accomplish this the material is passed through two machines, called the devil and the blowing-machine. The former consists of a cone-shaped casing studded interiorly with large teeth and a cone revolving inside of the casing, with teeth moving between the teeth of the latter. The larger end of the inner cone is provided with fan-blades which cause a current of air to pass through the machine, drawing the material with it. The fleeces, which have first been thoroughly stirred up by hand, are separated, fluffed, and the fur mingled and prepared for the blower by this operation. The blowing-machine consists of a number of sections, each of which is provided with a moving apron carrying the fur between two rollers. A picker revolving at a high rate of speed is located beyond the rolls and this tosses and fluffs the fur, the lighter particles falling upon the moving apron of the succeeding section, while the heavier impurities drop through a space between the picker and the apron. After passing through the blowing-machine the fur is ready for the next step, called "forming."

The forming machine consists essentially of a casing inclosing a revolving turntable carrying a perforated copper cone about a yard high. The machine is provided with proper feed apparatus, including an oil-cloth apron, feed-rolls, a picker, and a feed-drum. A powerful exhaust fan creates a strong suction, so that the fur is drawn from the drum and quickly and evenly covers the cone, through the perforations of which the air passes. The finer, lighter particles collect near the top of the felt body—later the crown of the hat—while the heavier, poorer fibers settle lower. A quantity of fur sufficient for one hat has first been weighed out, and when this is all on the cone the latter is covered with wet cloths and immersed in hot water for about one minute. The body is then stripped from the cone and undergoes the next or hardening process. In this, a workman first examines the body for imperfections to be removed or for weak places to be strengthened by the addition of a small quantity of fur, and then wraps about a dozen of the bodies in a woolen cloth, and rolling them by hand, gives them the initial hardening. This gives the body sufficient strength to allow handling with safety.

The succeeding step is called "first-sizing," and is the beginning of the felting proper. During this process the long, loose, cone-shaped body shrinks to a compact, closely-felted fabric of about one-third its original dimensions. During first-sizing the bodies are carefully and repeatedly inspected for imperfections or impurities, and the creases smoothed out. Sizing is simply a system of machine and hand rolling of the bodies, alternating with immersions in hot water. Naturally the rolling must at first be gentle, but as the fabric becomes stronger the work may be done more rapidly and with greater pressure. The bodies are usually first-sized three at a time, wrapped in bur-