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THE HYATT FILTERS.—MANUFACTURED BY THE NEWARK FILTERING CO., NEWARK, N. J.

The accompanying cut illustrates the latest construction of the Hyatt filters, the distinguishing peculiarity of the invention being the simple and effective plan of cleansing the filter bed from the impurities arrested during the filtering process. It is a well demonstrated fact that every filter bed should be entirely cleansed once a day, especially in warm weather, otherwise the organic matter remaining in the filter will decompose, and the water will issue tainted and foul, no matter how bright it may appear to the eye. The facility with which the filter bed in this filter can be washed will be readily understood by the description.

These filters are adapted to the use of sand, coke, animal charcoal, wood charcoal, or other filtering agents. As a rule, a mixture of sand and granulated coke is the most effective filtering medium.

The operation of this filter (cut No. 1) is as follows: The unfiltered water enters by the valve, A, and descending through the filter bed escapes by means of the perforated tubes, B, at the bottom, and the outlet, C. The rapidity with which the water is filtered is a matter of choice within certain limits. As an average rate these filters will purify three gallons per square foot of filtering surface per minute. In some waters a higher speed is consistent with suitable efficiency.

When the filter bed requires washing, the valves, E, in the top of the discharge pipes, D, are opened, and the outlet is closed. The water entering by the supply pipe has then no means of escaping except through the discharge tubes, D.

These tubes are tapering, and extend nearly to the bottom of the filter bed. As the water rushes up through these tubes it carries the filtering material with it, and discharges it through the valves, E, into the upper tank, which is full of water. In this tank the water, as it receives the flow from the filter beneath, effects a complete separation of the impurities that have accumulated in the filter bed, and they flow away with the excess of water through the waste pipe, G. Within five or ten minutes, according to the supply of water, all of the filtering material is thoroughly cleansed and discharged into the upper tank.

Now the filter below contains only water, while the tank contains the cleansed filtering material. To return this to the filter, the supply valve is closed, the discharge valve, F, and the waste valve, H, are opened. Immediately the contents of the upper tank commence descending through the valve, F, the filtering material settling in the filter, and the excess of water escaping through the waste valve, H. In this way the filtering material is speedily returned to the filter, receiving an additional rinsing by the water through which it falls, and settling in the filter clean as new and ready again for work. Then the valves, E, F, and H, are closed, the inlet and outlet valves opened, and filtration is resumed through a completely renovated filter bed. The water used in washing the filtering material being unfiltered will not immediately issue perfectly clear, and it is therefore discharged through the pipe, I, into the upper tank, where it remains for use in the next washing. By the time the tank is filled, the water comes from the filter perfectly clear, when the valve in the pipe, I, is closed, and the filter discharges bright, clear water for consumption.

Experience has shown that by this process repeated as a rule once in twenty-four hours, the filter bed is always in the best possible condition for good work. The washing entails practically no loss of filtering material. The average quantity of water used in cleansing the filter bed is about one per cent of the amount filtered. In filtering Mississippi and Ohio River waters, the filters are washed twice in twenty-four hours, using from three to five per cent of the water supplied to the filter.

Filters, such as are shown in cut No. 2, are worked in gangs or series of from two to ten in number. They are recommended where there is not sufficient vertical space to locate filters having the washing tank on the top, like No. 1. The method of filtering is the same as already described, the water passing in from the inlet pipe, L, and descending through the filter bed, passes out by way of the perforated tubes at the bottom and the valve, A. The distinguishing feature of No. 2 is the manner of washing the filtering material.

These filters are set up in series of two or more, as one of them in its turn contains no filter bed and remains idle while the others are filtering.

For example, in a series of three filters, as shown in the cut No. 2, two of them contain filtering material and may be used simultaneously for filtering, the third standing idle and containing only water. In washing this style of filter, suppose the last in the series of the three to be the idle one, containing only water. The outlet valve, A, in the first filter is closed, the valve, E, at the top is opened, and the waste valve, I, in the third filter is opened. The water coming in through the valve, L, can then only escape through the pipe, E, terminating near the bottom of the filter. Through this pipe the water rushes up into and through the horizontal pipe, H, and discharges into the third filter. In doing so the water carries with it the filtering material from the first filter, discharging it all into the third in about ten minutes. This carrying process is facilitated by a current of water from the upper part of the filter through the small pipe, C, loosening up and helping to separate the impurities from the filtering material during its passage through the pipe, H. As the filtering material and water fall into the third filter, the separated impurities flow out with the excess of water through the open valve, I, into the waste pipe; the filtering material being thoroughly washed, settles and remains in the third filter. Now this washing of the contents of the first filter into the third being accomplished, the valves, C and E, in the first filter, and the waste valve, I, in the third filter are closed. The inlet and outlet valves in the third filter are opened, and filtration proceeds. Next, the middle filter, or number two, may be cleansed, its contents being washed into the first filter precisely as had been done in the preceding case. Following in order, the filtering material in number three is washed into number two in the same way. And so in regular order of succession the filters are cleansed. From one-half to three-quarters of an hour each day is all the time required to keep a series of three in perfect order. And the washing of one filter does not interfere with filtration by its neighbor. It will be observed that with filter No. 1 less water is required in the washing process than in the gang filters, No. 2, because with No. 1 the first water coming from the filter after washing is preserved in the upper tank for use in the succeeding washing, while in No. 2 the first water being unfiltered would be run to waste until it is succeeded by completely filtered water. This, however, is not a serious difference, because within two or three minutes after washing, the filters will deliver perfectly clear water.

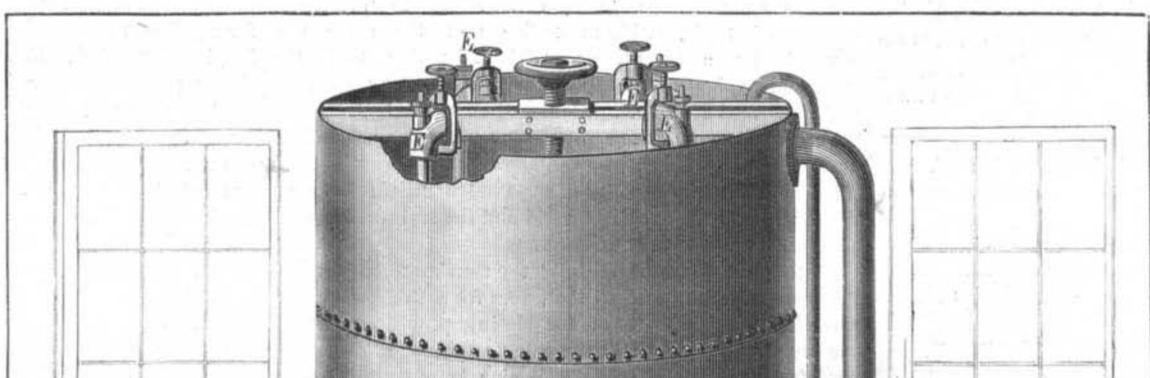

Fig. 1.—THE HYATT FILTERS.

We now come to a highly important part of the subject of water filtration. It is well known that purely mechanical filtration, when applied to such waters as those of the lower Mississippi and other Western rivers, is impracticable for any industrial purpose. There are required such fine filtering media, with the passage of water at so tardy a rate, that large and economical results are out of the question. So many efforts at mechanical cleansing of these waters have been made, and all ending in failure, that the people of the Southern and Western valleys seem to have no faith in any idea of filtration. During the past summer, however, one of the Hyatt filters, eight feet in diameter, which was erected at the pumping station of the New Orleans Water Works Company, filtered the water directly from the Mississippi at the rate of from one hundred to one hundred and fifty gallons per minute, and delivered it as clear as crystal. This was done by a combination of chemical with mechanical means, and at a cost for chemicals of less than one-half a cent per thousand gallons of filtered water. This was accomplished by using in this instance one of the well known agents used for coagulating the impurities in water and precipitating them to the bottom of a reservoir or settling tank.

Alum had been long and extensively used in this way. Many other coagulants had also been used in the same manner, but they all required large reservoirs and considerable time to clarify the water. Perchloride of iron, which is used in connection with the Hyatt filter, has long been known as an excellent coagulant of the principal organic and inorganic matters which pollute and discolor various waters. But wherever it had been used, settling tanks or reservoirs were employed. The perchloride of iron or other coagulant was added to the foul water in certain definite proportions; and after the coagulation and precipitation had been completed, requiring from twelve to twenty-four hours, the

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resulting clear water was decanted or siphoned off from the precipitated impurities.

Afterward these impurities were disposed of by flushing, or in some way washing the reservoirs. This was not, however, found entirely satisfactory. The process employed in connection with the Hyatt filter consists of a supplementary apparatus, by means of which the requisite quantity of the coagulant is injected into the unfiltered water in its passage to the filter. The coagulant is almost instantaneous in its operation ; but the precipitation of the coagulated impurities is necessarily slow when used in a reservoir, as they descend to the bottom only by the force of gravity. With the filter, however, precipitation is of no consequence, the filter bed immediately arresting the coagulated impurities and transmitting bright, clear water without delay. An interesting fact, also, is that less than one-half the proportion of coagulant is required when used with immediate mechanical filtration.

This apparatus for injecting the coagulant will be seen by the side of the filter in the illustration No. 1. From the supply pipe, A, the pipe, M, connects with one end of the cylinder of the injector. Within this cylinder is a piston, the water from the pipe, M, pressing against one side of the piston. In the cylinder on the other side of the piston is the coagulant in solution. From this other side the coagulant passes through the rubber hose, L, into the pipe, A, where, commingling with the water during its passage into the filter, it performs its office of coagulating the impurities in the water, the impurities being arrested during the passage of the water through the filter.

It will be observed that the pressure from the pipe, A, will be equal on each side of the piston in the injecting cylinder, by virtue of the connecting pipes, M and L, and that without some other application of force the injector would remain at rest. But as a definite proportion of the coagulant to the unfiltered water should be supplied, this is effected by communicating the proper motion to the piston within the cylinder. This is accomplished by means of the connecting rod, K, which propels the ratchet wheel, J, and moves the piston by a screw.

This connecting rod, K, is operated either by a water meter propelled by the filtered water, or by the pump which supplies the filter. It is so regulated that the rate of supply of the coagulant will bear a proper ratio to that of the supply of water to the filter. When perchloride of iron is used, the consumption will be one part of this material to from thirty thousand to sixty thousand parts of Mississippi River water, according to its state of impurity. The injecting cylinder has a capacity of at least twenty-four hours' supply of the coagulant. To supply the coagulating solution at the proper rate, the piston of the cylinder is propelled by the means indicated at the requisite speed.

The lining of the injecting cylinder is made of a substance that is not corroded by the coagulating material. No part of the coagulant passes through the filter with the clear water.

It combines with the impurities, and with them is arrested by the filter bed and periodically washed away. Preparations of iron or of lime are well known to be absolutely harmless, in a sanitary point of view in any event.

This method of purifying such water as the Mississippi is going into extensive and successful use in New Orleans and upon Louisiana sugar plantations.

The Hyatt filters and the processes here described are the subject of several patents in the United States, Canada, and principal European countries. Either of these described filters is adapted to the purification of river, pond, or lake water in any quantities, and in all situations and under any pressure, the coagulant being used only where the character of the water is such that mechanical filtration alone is not effective.

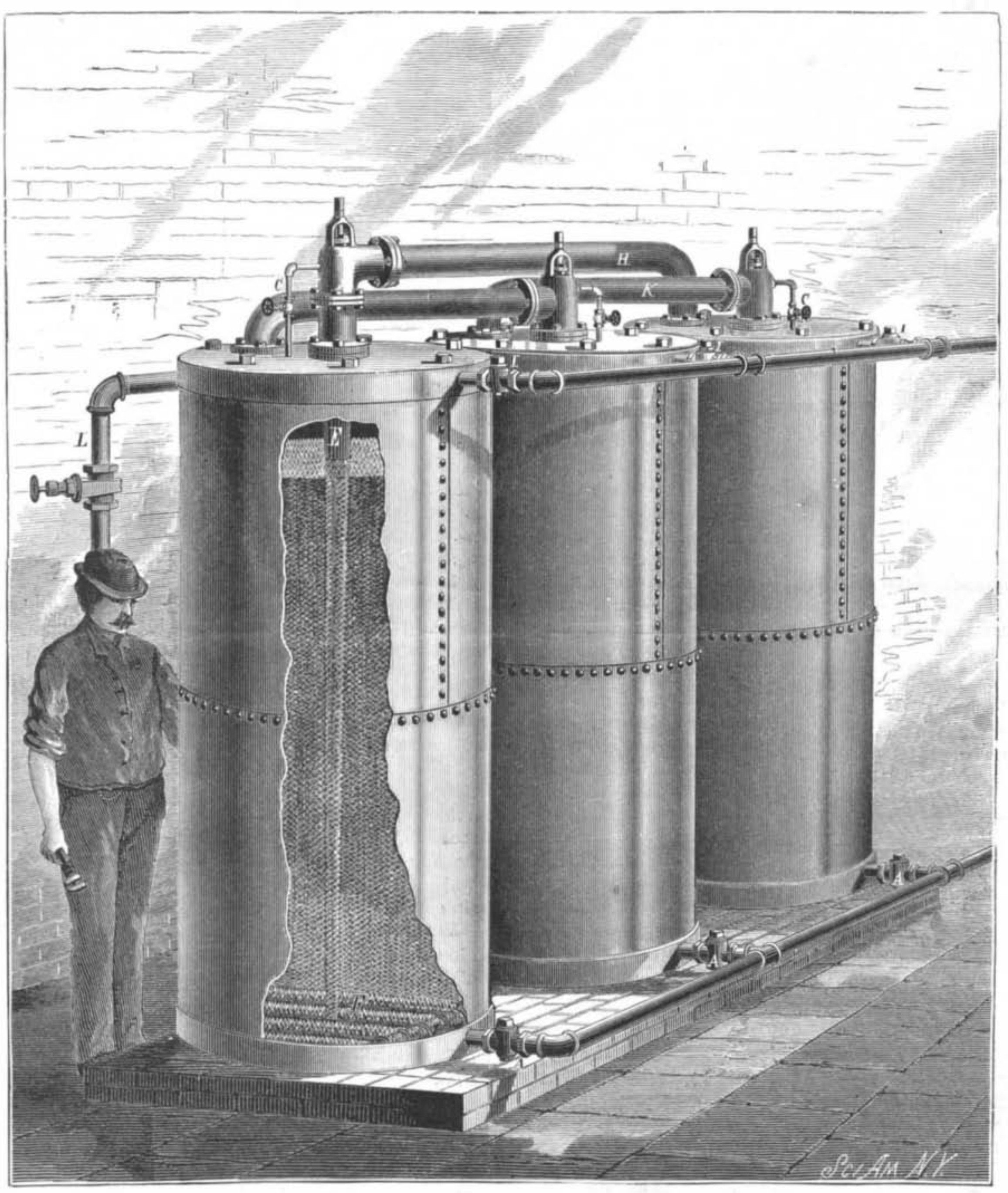

Fig. 2.—THE HYATT FILTERS.

The Sewing Machine Industry.

A contemporary has been looking up the origin of the sewing machine, and collating facts relative to the extent of its present manufacture.

Forty-six years ago, on February 21, 1842, says the writer, J. J. Greenough took out the first United States patent on a sewing machine, according to the patent records as they now stand. Lye's machine was patented in 1827, but as the patent records of that year were burned, it is not known what were its claims. The first sewing machine in the world, intended rather for embroidering than plain sewing, was patented in 1755. The next machines in order of time were Thomas Saint's, English (1790); Duncan's, English (1804); Rev. J. A. Dodge's, American (1818), not patented on account of the bitter opposition of the tailors; Thimonnier's, French (1830); and after some modifications was patented in the United States in 1850. This was the first machine to come into practical use. Thimonnier was mobbed by the tailors and barely escaped being killed. He died in poverty in 1857. Then came Walter Hunt's, American, 1832. He neglected to patent his invention. Elias Howe's machine was patented in 1846; A. B. Wilson's, 1849; I. M. Singer's, 1851; Grover & Baker's, 1851; the Weed, Finkle & Lyon and Parham, 1854; the Florence, 1855. From 1857 to the present day but few new machines have been patented, the principal ones being the Willcox & Gibbs, the Empire, the Ætna, the Domestic, and the Victor. In all, since 1846, over two thousand patents have been issued on sewing machines and their different parts and on sewing machine attachments. The machines are best classed by the kind of stitch produced. Four-fifths of all the machines now made use the lock-stitch. In the United States to-day, according to the last census, there are 106 sewing machine establishments, with an invested capital of $12,501,830, employing 9,283 persons, to whom are annually paid in wages $4,636,099. The value of materials used is figured at $4,829,106, and the value of the products at $13,863,188. Sixteen States monopolize these manufactures. Over half of the invested capital, and fully one-half of the value of the products, are centered in the States of New Jersey and Connecticut. Not more than three or four concerns in the country extend their operations over the whole range of work on a sewing machine, including case making and needle making. In some cases, however, the management covers the wide range from the ownership of forests and getting out raw material to extensive transportation facilities and ramifications of agencies for marketing the product throughout the world. The operations in sewing machine manufacture are many and varied, entailing in the turning out of a machine the aid of wood working, foundry work, machinery, forging, tool making, needle making. Besides these are numerous other details, such as japanning, boxing and box making, testing, teaming, porterage, and common labor.

"Taking Aim"—Two Eyes or One?

Quite a lively discussion is said to be taking place in England as to whether a marksman generally takes aim with both eyes or one in rifle shooting. Those who consider that one eye alone is used endeavor to prove their case thus: Hold, they say, a ruler before the right eye in such a position that when the left eye is closed it covers the object ; now shut the right eye, and see in which direction the ruler points ; it will be found to be many inches, or feet, or yards away to the right, according to the distance of the object. It is therefore obvious, so the argument runs, that a man fixes the object, bird, or target, as the case may be, with his right eye, and neglects the image formed on his left retina altogether. The difference of opinion upon the subject depends, according to the *Lancet*, on the different practice of aiming adopted by different sportsmen. If a man shoots slowly, accommodates his eye to the sight or sights on the barrel of his gun, and then relaxes his accommodation for the distant object, and still more if he alternately exerts and relaxes his accommodation, for which there is ample time in target or any other deliberate shooting, then undoubtedly he uses one eye, and, of course, usually the right eye, alone. But the act of accommodation is a slow process, it requires nearly, if not quite, a second, and in ordinary bird-fowling the sportsman has no time for this. The more practiced he is the less he attends to his barrel and his sights. He first fixes the object with both eyes, and then points the barrel at the precise elevation and in the direction which long experience has taught him will be effective when the gun is discharged. He adapts his eyes for the distant object, and the rest is mechanical. Corroborative evidence that this view is correct is afforded by the fact that the bowler at cricket never closes one eye or troubles himself about any line. He simply fixes the wicket or the precise spot in front of the wicket on which he desires to pitch the ball, and leaves the rest to the coordinating nervous centers. The billiard player, again, in the vast majority of cases uses both eyes, and fixes alternately the near and the distant ball with both eyes. Therefore, if a man uses his sights and attends to his barrel as well as to the object, he employs one eye only, neglecting the impressions derived from the other. If, however, as is customary with experienced sportsmen, he takes no thought of his gun and fixes the distant object, then, undoubtedly, unless he has some defect of vision, he uses both his eyes, the visual lines of which at thirty yards are almost parallel to each other.

Butterine vs. Butter.

There is a good deal of butterine made and sold in Europe, and there, as here, people seem to have little apprehension how extensively it is used. The *Farmer's Gazette*, of Dublin, publishes a statement showing how difficult it is for ordinary judges to tell butter from butterine. Some fine Normandy butter, costing 48 cents a pound, and a sample of butterine, bought of a local retailer for 22 cents a pound, were submitted to a jury of nineteen farmers, who tasted and examined both samples. Ten out of these nineteen judges declared the butterine to be the butter. The makers of butterine in this country use all the way from 60 to 85 parts of neutral lard to 40 and 15 parts of good butter, respectively, in making butterine. These are thoroughly mixed, salted, and colored a golden yellow, and the tubs are branded with fancy names as from country creameries.

It is said an infallible test is to melt the butterine and then suddenly chill it by surrounding it with cracked ice, when the lard goes to the bottom and the butter to the top, the line of separation being plainly visible.