APPARATUS FOR REMOVING GREASE, AIR, AND IMPURITIES FROM FEED WATER.

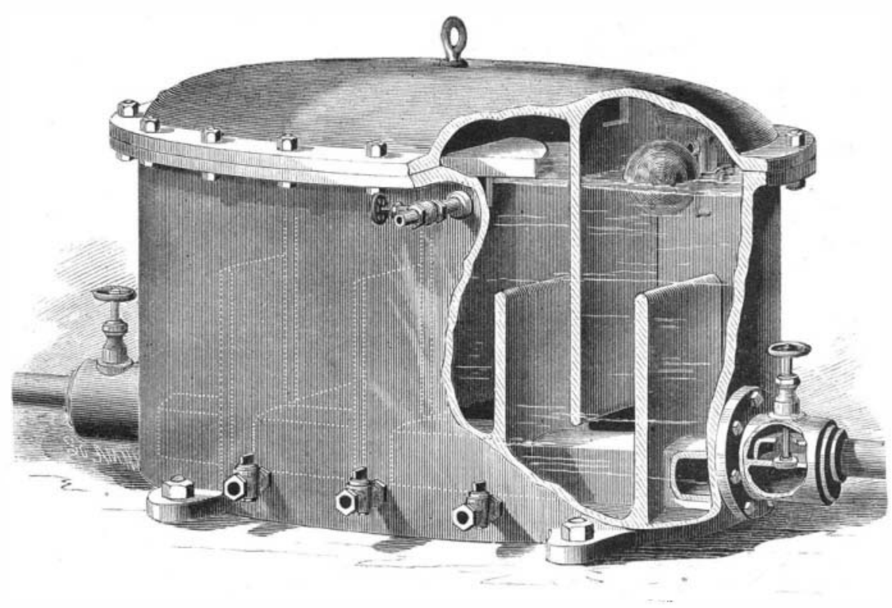
The first practical application of the apparatus shown in the engraving was on the steamship Walla Walla, on a voyage from New York to Portland, Or., and while it operated extremely well during that experiment, it has since been improved so as to make it almost automatic.

It removes the air usually forced into the boiler with the feed water, thus, it is claimed, removing the cause of pitting the internal surfaces of boilers and tubes by removing the free oxygen from the water. The removal of the air also prevents priming, and in condensing engines it effects a great saving by excluding the air from the boiler and cylinder, thus preserving the vacuum; and in addition to these advantages, it insures even feeding in a battery of boilers, and in all cases the apparatus indicates whether the pumps are in action by the continual working of the air relief.

This apparatus extracts all grease and foreign matter which would otherwise enter the boiler and be deposited as scale, or would form a surface scum which needs continual blowing.

The complete manner in which the oil is extracted from the feed water is shown by the fact that steam taken direct from the main boilers where this device is applied, has been used for cooking without imparting the slightest flavor of oil, even when the engines were lubricated with crude petroleum. This is an important advantage in distilling water for drinking and culinary purposes.

This extractor is now in use on the following steamships: Walla Walla, Tallahassee, Chattahoochee, Nacoochee, Finance, and is being applied to other steamships in the course of construction.



WASS' GREASE, AIR, AND MUD EXTRACTOR.

The extractor, as shown in the engraving, consists of a vessel of suitable dimensions and strength, fitted with transverse partitions extending alternately from the top and bottom. The grease rises to the top of the water, and is removed through the oil discharge. The solid matter is precipitated, and may be removed from time to time. The air discharge valve is operated by a float as the upper part of the extractor becomes filled with air and the level of the water falls.

There are two varieties of these extractors made, one with a by-pass for allowing the water to pass around the partitions without going over and under them, the other without the by-pass. This apparatus is highly recommended by engineers who are familiar with its merits.

Further information may be obtained by addressing Messrs. Motley & Sterling, sole agents, 86 John Street, New York city.

Destruction of Ants.

A correspondent in the *Tropical Agriculturist* says: Take a white china plate and spread a thin covering of common lard over it; place it on the floor or shelf infested by the troublesome insects, and you will be pleased with the result. Stirring them up every morning is all that is required to set the trap again.

AERIAL NAVIGATION.

We give an engraving of a new flying machine, designed by Professor Baranowski, a small model of which has been repeatedly tried, we are told, with much success in St. Petersburg, Russia.

The apparatus is thus described by the *Revue Militaire*, of Paris. It consists of a great cylinder intended to have the form of a gigantic bird. The interior is provided with steam machinery, having a power proportioned to the size of the apparatus, with space for working the same; it has two lateral propellers, and one rear propeller; and their rotation determines the direction of the machine, whether it shall be vertical or horizontal; at one extremity of the cylinder is seen a species of oar which serves as a rudder; two great wings, composed of strong membranes, give an ascending motion to the apparatus, and keep it afloat in the air; the part which represents the beak of the bird is so arranged as to permit the entrance of air to the interior of the cylinder, to supply the crew and for the combustion of the fuel; the smoke, gases, and steam issue from the end, which, when the structure passes through space, will give the appearance of the tail of a brilliant comet. From the underside hangs a pendulum weight that keeps the apparatus in proper equilibrium.

In respect to the general problem of aerial navigation by flying machines, the *Engineer*, of London, makes the following observations:

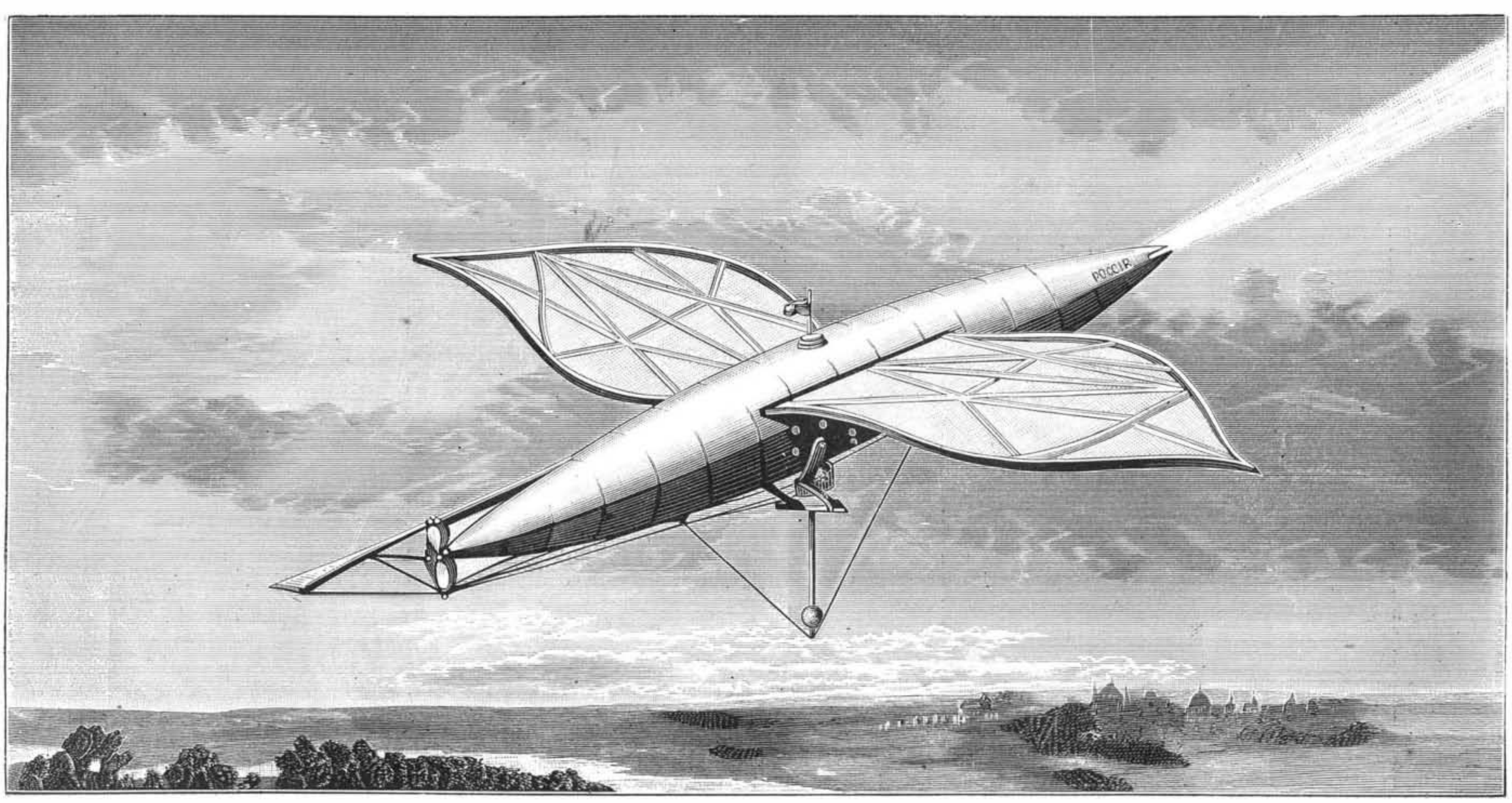
It may be urged that there is nothing mysterious about wing motion, and a simple up and down flapping will at least suffice to raise a bird in the air. Why should not men fly? The answer is that they are not strong enough. If we consider birds as machines, we see in the first place that they are all comparatively small. There is no bird of flight which weighs as much as even a very light man; but there are many birds which are far stronger than men. The albatross is, we believe, the largest—we do not mean the heaviest—bird of flight in existence. Its wings measure sometimes as much as 13 feet from tip to tip, but the total weight of the bird seldom, if ever, exceeds 28 pounds, or one-sixth that of a powerful man. But the albatross can keep its wings in motion for a whole day, while the strongest man would be exhausted if he had to keep beating the air with them for half an hour.

A great deal has been written from time to time about the effect of the wind on inclined planes in keeping birds afloat in the air. Those who have a competent knowledge of the laws of dynamics are, however, aware that the inclined plane action cannot alone keep a bird from falling to the ground. The action is at best just that of the wind on a kite; and the equivalent of the string must be provided or the bird will be carried away, just as the kite is when the string breaks. Birds, when sailing, are either going with the wind or are using up momentum acquired by previous rapid motion. The work done by the bird will vary continually; but it is strictly analogous to that of a swimmer, who, carrying a load, has to keep himself afloat by his own exertions. There is no way out of this. Nothing is got from the air in the way of help, save when upward currents strike the flying bird; and that such currents exist, every engineer who has seen the decking of a bridge lifted in a gale well knows.

Returning then to our albatross, the work it does is equivalent to continually lifting 28 pounds. The idea that the bird is buoyant in the air is a delusion. If it weighs dead 28 pounds, it will weigh living 28 pounds, and the variation in the displacement of the dead and living bird cannot represent more, at the most, than an ounce. In round numbers, 13 cubic feet of air weigh 1 pound. The albatross, therefore, represents no less than 13 × 28 = 364 cubic feet of air, while its entire displacement is probably at most 4 cubic feet. An increase in dimensions of one-fourth when alive as when compared with the same bird dead would represent about $\frac{1}{360}$ of its weight saved by extra buoyancy, which is nothing. The weight of the bird then may be regarded in exactly the same light as the weight on a brake driven by a portable engine. The brake wheel is always trying to lift it up. The power expended is measured by the distance passed over by any point in the rim of the brake wheel in one minute, multiplied by the weight and divided by 33,000 per horse power. Now, if we could tell the distance passed over by the bird's wings at each stroke, and the number of them, we should, knowing its weight, be able to estimate the power expended. We cannot do this in the case of the condor or albatross, but bearing in mind the small specific gravity of air, we shall not be very far wide of the mark if we say that an albatross probably possesses as much muscular energy as a man.

There is no engine in existence, certainly no steam engine and boiler combined, which, weight for weight, gives out anything like the mechanical power exhibited by, let us say, the albatross.

It is simply for lack of muscular power that man can never fly. There is no combination of wings or arrangements



PROFESSOR BARANOWSKI'S NEW STEAM FLYING MACHINE.

of any kind which will compensate for this fact. Whether he can produce a machine to supplement his own want of force remains to be seen. Such a motor cannot, we think, be driven by steam. It is, however, not impossible that a machine might be made which would be caused to fly by means of a small electric motor run at a very high speed and worked by the aid of a couple of wires from the ground. This, however, would hardly be flying in the true sense of the word. That wings and such like things can be made we have no doubt; and experiments enough have been made to prove that, if power enough be available, flight can be achieved. When a machine can be made, each pound of which will develop as much energy as each pound of a bird, flying may be possible—not till then.

Decay of Building Stones.

Prof. A. A. Julien, of Columbia College, lately read an interesting paper before the New York Academy of Sciences, in which he stated that in this city 11·6 per cent of the houses have stone fronts, mostly of sandstone. The relative proportions of stones used in buildings are as follows: Brown stone, 78·5 per cent; Nova Scotia sandstone, 9 per cent; marble, 8 per cent; granite, 2 per cent; Ohio sandstone, 1·5 per cent; gneiss, 1 per cent. The number of brick buildings forms 63 per cent of the total; frame houses, 24 per cent; stone, 11·6; iron, 0·9.

The effects of weathering upon building stones has received less attention in modern times than it deserves, and very few modern buildings will last a thousand years, while many of them will be gone before their own architects are dead. In cities the weather produces a different effect on stones from what it does in the country. Marble suffers from three causes: it dissolves on the outside and is washed away, it undergoes internal disintegration, it also bends and cracks, as found by Prof. Geikie, who has studied the effect of weather upon tombstones in Scotch graveyards. Some architects have said that brown stone is no better than gingerbread to put on a house; it adds nothing to its strength, and in sixty or eighty years all the sharp corners will be rounded off. Some houses less than ten years old show signs of decay, especially where Lockport limestone was used. Lenox Library began to decay before it was finished. The time that granite will last depends on the climate. An obelisk that stood for forty centuries in Egypt, after removal to Paris was full of cracks in forty years, and probably will not last four hundred years. How long will the one last that we have imported and set up in a most exposed location in Central Park?

Nova Scotia and Ohio sandstones soon become stained and streaked, and marble sometimes crumbles on the surface so that it can be scraped off, as that in the Cathedral on Fiftieth Street.

The enemies of building stones are of three kinds—chemical, mechanical, and organic. Of the chemical agents there are the acids which dissolve carbonates, such as sulphurous and sulphuric, from combustion and from the decay of organic matter; there is carbonic acid from the air, nitric acid in summer showers, hydrochloric acid is always present near the sea, and besides these, carbolic and hippuric acids are in rain water. We do not know what there is in the air of New York city; it has never been analyzed. There must be some effect produced by the oxygen, ozone, ammonia, and sodic chloride in the air.

Among mechanical agents we have frost. In this climate there is a variation of 120° in the temperature within the year, and sometimes 70° in a day. The action of wind alone, or carrying sand and street dust, causes friction. Crystallization by efflorescence and pressure are other causes of decay, but too much stress has been put on the crushing test. Fire is another destructive agent.

Among organic agents we have vegetation on land and the marine animals in the water. John C. Draper maintains that certain lichens grow on houses in streets running east and west, but the speaker had never seen any lichens, although confervæ are quite common in this city. The influence of lichens is a point still in dispute; some say they preserve the stone, others that they injure it. A load of Italian marble sunk in our bay was destroyed by boring animals, and the piers of the Brooklyn Bridge may suffer from the same cause.

Among the internal elements of durability or the reverse is the chemical composition, such as solubility, also the influence of liquids in cavities, and as water of hydration; changes in the degree of hydration are continually going on. Also physical structure of the stone. Mica is an element of weakness. Porosity enables the frost to penetrate deeply, as often seen in the lintels and doorsteps of brown stone houses. In light colored stones, streaks form, white fluorescences, or black stains from soot, etc. Manganese also forms black stains, confervæ green ones. Hardness and crystalline structure are elements of permanence, also homogeneity. Much often depends upon the character of the surface. Smooth polished granite decays more than that which has not been polished. The position with reference to prevailing winds and rain is also an important factor.

HOW TO JUDGE OF BUILDING STONE.

Most of the tests are antique and unworthy of notice. Some idea can be obtained from an inspection of the "outcrop" at the quarry itself. Also, by examining old masonry and tombstones. Mr. Julien had examined the gravestones in Trinity Churchyard. The red sandstone, like that of which the church is built (from Little Falls, N. Y.), stood the best, and is superior to any sandstone now used in the city. The old test by dipping the stones in sodic sulphate and letting it crystallize, and repeating this twenty or thirty times, is fallacious, as it cannot be compared to frost. If dipped in water and frozen, and this repeated fifty times, the result is almost imperceptible. Other tests were mentioned, such as heating to 600° and putting in water, acid vapors, etc.

MEANS OF PROTECTION AND PRESERVATION.

1. Selection. In no quarry is the stone so good that all of it ought to be used; but it is used indiscriminately. 2. Seasoning. Wren allowed the stones he used to lie three years on the sea-beach. 3. Position in regard to its lamination. It should lie on its natural bed. 4. Shape of the projections. 5. Artificial protection, such as paints and oils. The best protection for limestones is waterglass. For sandstones, it must be mixed with baric or calcic chlorides. It has been tried in some other countries, but not here. If oil is first applied, it prevents the use of water glass for ever after.

The objections made to the use of the stone, the speaker thinks not well founded, and here, where it is so abundant and accessible, it should be used much more than it is. The lecture was illustrated with lantern views.

The Scope of the Sewing Machine.

There are few conquests left for the sewing machine of the future to make in the line of variety. So various have been the uses to which our present machines have been adapted that little is left the hand needle to do. There are machines to sew the heaviest leather, and others to stitch the finest gauze or lace. Machines make button holes and eyelet holes superior to the best hand work, and at a speed that would asphyxiate an ordinary seamstress; while buttons are sewed on by modern attachments faster, in both senses, than can possibly be done by the needle with the "eye in the other end." There are overseam machines that sew carpets, others for glove work, and similar ones for fur sewing, and these leave a seam that flattens out neatly, and the stitching is as smooth and regular as can be desired by the most exacting. Other machines sew books and pamphlets, while still others, with wire for thread, sew brooms and brushes. Sewing machines with the shuttle concealed in the end of a long and slender arm sew the soles on shoes and boots with a speed and rapidity that make two pair cost less than one pair would otherwise cost, while outlasting four pair of the old fashioned ready made foot gear.

Dash machines will sew around the dash of a carriage almost in the twinkling of an eye, and such is their capacity that they will stitch to the center of an eight foot circle. Writing and embroidery of various kinds may be done on almost any of our modern machines without any attachment, and some of them will darn and patch in a manner to delight the tired mother of a houseful of romping boys. Two or more parallel rows of stitching may be done on the twin—there may be a triplet—needle machine; and one of the latest achievements of this machine is to sew the flat seam in flour bolt cloth, a feat until recently considered impossible. Cordage is sewed by machine, and so is straw braid for hats and bonnets. The scope of the sewing machine seems limited only by the variety of work the needs of mankind—and womankind—may demand. The sewing machine inventor, as a class, may soon have to sit down, as did Alexander, and cry because there are no more worlds for him to conquer. He will doubtless regret that he was not born a little earlier in the sewing machine age, before all the great inventions had been studied out and perfected. There is little left for him to do except in the direction of perfecting the present machines and cheapening their production. But even here he will find ample and profitable work for his inventive genius and mechanical skill.—*Sewing Machine Journal.*

The New Steamship Oregon.

The *Engineer* gives the following account of the Oregon, a new steamer for the Guion Line:

"It is anticipated that she will be ready for her trial trip about midsummer, and she is intended to excel in speed the fastest ship now afloat. She will not be much larger than the Alaska; but her engines are to indicate no less than 13,000 horse power. She will have but one screw, as we understand about 24 feet in diameter, with a pitch of nearly 40 feet. Steam will be supplied by 12 boilers, each with 6 furnaces 3 feet 6 inches in diameter, the grates being a little over 6 feet long. We may compare her with the Alaska, which ship has 9 boilers with 6 furnaces in each, of about the same size. Comparing grate areas, we find that the aggregate surface in the Oregon will be 1,512 square feet, divided among 72 furnaces, while that of the Alaska is 1,134 divided among 54 furnaces. As the Oregon will burn about 20 pounds of coal per square foot of grate per hour, her consumption in 24 hours will not be much under 300 tons, and allowing that each ton of coal evaporates 9 tons of water, we find that no less than 2,700 tons of steam will pass through her engines every 24 hours. A tank 100 feet square, to hold 2,700 tons of water, must be nearly 10 feet deep to prevent the water from running over the edge. If the tank were 50 feet square, the water would stand 38 feet 10 inches deep in it. If the water were supplied to a town, allowing 4 cubic feet or 25 gallons per head per day, it would suffice for a population of 24,000 souls; 6,000 tons of air will pass through her furnaces, representing a volume of 174,720,000 cubic feet through a pipe 11 feet 4 inches diameter. This volume of air would flow at the rate of 18·8 miles per hour, a strong breeze to walk against. The total weight of water evaporated on the run across the Atlantic will not be far short of three times that of the whole ship's cargo, engines and all. We give these figures to enable our readers to form some idea of what 13,000 horse power means; and we may supplement them by adding that it is equivalent to 191,517 tons lifted a foot high every minute, or the same weight lifted 1,440 feet in 24 hours. Assuming that she makes 20 knots an hour, or, omitting fractions, 2,028 feet per minute, the thrust of her screw—that is to say, the force pushing her ahead through the water—will amount to over 94 tons, or about as much as 20 of the most powerful locomotive engines in England would exert if all were pulling at her together. Among the other difficulties which crop up when we have to deal with such enormous powers as these figures represent, we mention that of getting the coal to the fires. We see that in the case of the Oregon no less than 300 tons a day, the full load for a coal train of 30 trucks, will have to be handled every 24 hours. If the ship were at rest, the problem would not be easy of solution, but it becomes very hard indeed to deal with in a rolling and pitching vessel. All is done, of course, that can be done in arranging boilers and bunkers to accommodate each other, but it is evident at a glance that out of a total quantity of, say, 2,500 tons of coal a great deal must be stowed at a considerable distance from the furnaces. It does not appear that any mechanical device has yet been hit on in the way of a railway which answers better than the existing arrangements, by which the whole of the work is effected by sheer manual labor."

Enlargement of the Suez Canal.

The Works Committee of the Suez Canal have adopted a programme of improvement works requiring several years to carry out, and estimated to cost 23,000,000 francs.

The improvements involve rectification of the west bank of the channel of the outer port of Port Said; formation of a new basin at Port Said; widening of the canal in the passage of the small Bitter Lakes; widening of the canal between Suez and Kilometer 152; doubling of the Ismailia station; embankment of Kantara station, and of the station of Kilometer 133; rectification of the eastern curve of Timsah station: also of the southern curve of the small lakes; also of the northern curve of El Guisr; also of the curve of Toussoum; widening of the canal off Port Tewfik; deepening of the basin of Port Tewfik; and the annual continuance of the masonry work.

The committee think these works will be adequate for the doubling of the present traffic, or 10,000,000 tons. In anticipation, however, of a still greater increase, they think it will be expedient, at a date which cannot be yet fixed, to take into consideration the idea of the cutting of a second channel, parallel to the present one. Such a second channel, definitively meeting all future exigencies, would involve negotiations for obtaining, besides the compensations foreseen, the land for such a channel, and for the enlargement of the stations and ports.

Dyeing with Aniline Black.

To produce a black that will not turn green the Swedish Vanadium Company publish the following simple process in the *Industrie Blatter:* 1,250 parts of white starch and 420 parts of dark scorched starch are boiled in 5,500 parts of water, and after it has cooled to 122° Fahr., 800 parts of aniline oil and 800 parts of hydrochloric acid (specific gravity 21° B.) are added. When the mixture gets cold, 420 parts of sodium chlorate and 500 parts of boiling water are added. At the time of using it, but not a moment sooner, 200 parts of a vanadium solution are poured into this mixture. The goods are left in this bath for *two* days, and then passed through a solution of potassium bichromate (half per cent), warmed to 158° Fahr., and next soaped as usual.

Instead of adding the hydrochloric acid in these proportions, it is still better to neutralize the aniline drop by drop until a few drops of the liquid impart a greenish blue color to a very dilute solution of Paris violet (1 in 1,000).

The vanadium solution is prepared by dissolving 10 parts of vanadiate of ammonia in 40 parts of dilute hydrochloric acid at a gentle heat, adding some glycerine, and then boiling until the solution has acquired a deep green color and all has been dissolved. It is then diluted with water until it equals 1,000 parts, and preserved in well closed vessels.

The Use of Liquid Carbon Dioxide.

A. W. Hofmann has called attention to the extensive use of liquid carbon dioxide for various purposes. The gas is condensed and sold by F. A. Krupp, of the world renowned iron works in Germany. It is used mostly to compress steel castings in closed moulds. It is placed in wrought steel vessels which hold 100 kilos of the liquefied gas. A pressure of 800 atmospheres is obtained. In Krupp's works all the ice is manufactured with the aid of a machine which is kept constantly at work by compressed carbon dioxide. A large quantity of soda water used in the same works is made from liquid carbon dioxide. One of the most interesting applications of the compressed gas has been recently made in Berlin in connection with fire engines. Each engine is supplied with a large vessel containing the liquid. This is brought into use as a motor the instant the engine arrives at the place of the fire, and some of the gas is thrown with the water upon the flames. As soon as sufficient pressure of steam is obtained, the use of the carbon dioxide is stopped.—*Berichte der deutsch. chem. Gesellschaft,* xv. 2668.