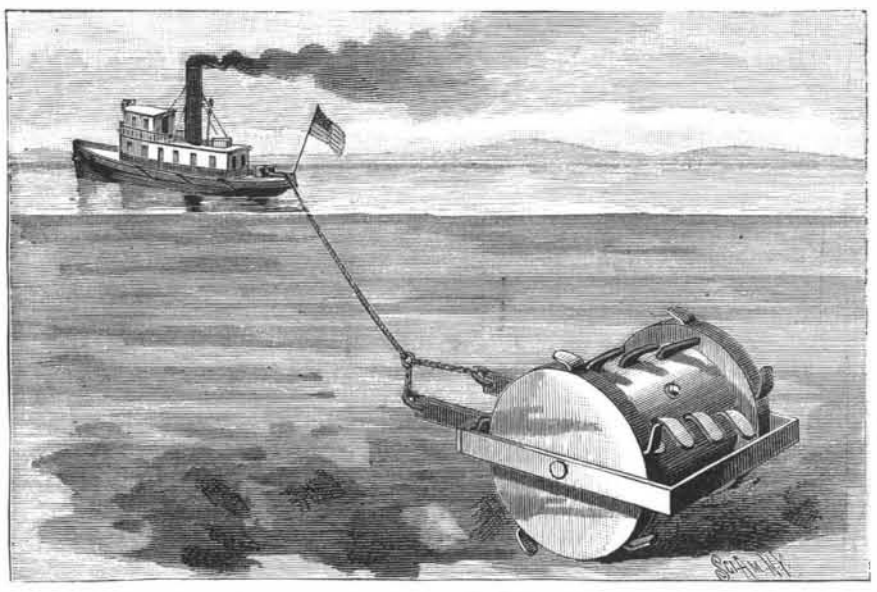
scend through a simple difference of level into a gallery 10 feet in diameter, calculated to discharge double the present production of Paris in liquid manure. It is from this gallery that branches the derivation designed to fertilize the plain of Acheres. It crosses the Seine at Herblay through a siphon, whose construction and putting in place we shall describe. This siphon, for which a series of timberpiers was previously constructed, was submerged during the first week of October.

It consists of two iron plate pipes ¾ inch in thickness, spaced externally 20 inches apart and connected at every 10 feet by interties. Each pipe consists of two oblique parts and of a straight part 520 feet in length. The total length between perpendiculars of the siphon thus constituted is 660 feet.



BENTINCK & RENNER'S DIGGING MACHINE.

A complete siphon thus constructed weighs about 250 tons, and the putting of it in place is not easy. It was necessary to effect it in an interval of only three days' stoppage of navigation. Engineer Lannay succeeded in doing it with the co-operation of Messrs. Le Blanc & Marcadet, the contractors.

Our engineers had in truth some previous analogous examples. One of the best known is the siphon of the Isle of Saint Louis, laid in September, 1890, and which empties into the great collector of the right bank of the Seine the sewage water of the left bank which was formerly thrown into the river through nine discharges opening in the two arms that encircle the island. The siphon of the Isle of Saint Louis was but 345 feet in length, and yet the laying of it furnished useful data for the execution of the special work under consideration.

The laying of the Herblay siphon was done in a transverse excavation 13 feet in width, made by a dredger in the bed of the Seine and carefully leveled with beton. The siphon was carefully let down into the excavation and the latter was then covered with beton, so that nothing should interrupt the very busy navigation going on above.

Each branch of the siphon is composed of iron plate sections connected and riveted end to end, at first in groups of four at the works, and then one to the other upon the field of operations.

Before the operation, the tubes as a whole rested upon nine timber piers planted at right angles with the bank. The two extremities having been perfectly closed with plugs, there was thus formed a true float that it sufficed to allow to glide into the water, just as a ship is launched by lifting it with jack screws.

The tubes being afloat, they were led across the river exactly in the transverse direction of the excavation previously marked out. Then they were seized between three frames forming slides and designed to guide them to the bottom. The submersion was effected by charging the two siphons with rails laid upon the cross pieces that connected the two tubes. These rails were removed by divers after the termination of the operation.

It was not until after the putting of the pipes in place that the water was allowed to enter them, for the introduction of it before this would have sufficed to sink them to the bottom, and eddies and displacements might have been produced that would have interfered with the precision of the operation.

Before the siphon was put in place, and while it was still out of water on the field of operations, it was tested in the first place at a pressure of six atmospheres, in order to make sure that it presented no leak or defect.

Such, in brief, is a description of the operation of which the accompanying engraving, from *L'Illustration*, gives the general aspect.

THE Suez Canal, the greatest work of marine engineering, is eighty-eight miles long, and reduces the distance from England to India from 11,379 miles to 7,628 miles.

A DIGGING MACHINE TO DEEPEN CHANNELS, ETC.

This machine, when submerged and dragged along the bottom of a waterway, digs into and carries up the sand, etc., permitting the raised material to be floated away by the current. It has been patented by Eliza J. Bentinck and Julia A. Renner, of Galveston, Texas.

In a suitably made frame, connected by brackets with a chain leading to a boat, or other means of pulling the machine, is journaled a shaft carrying drive wheels and a drum, both the wheels and the drum having shovels arranged about their periphery. The drum is hollow, and when empty floats upon the water, in which condition it is most easily moved to the place where the work is to be done, the device sinking on the removal of a plug, which allows the drum to fill with water. By means of a pinion on the shaft, an idler, and a gear on the inner rim of the drum, the latter is driven in a direction opposite to that in which the drive wheels travel. It is designed that the drum shall be ten feet in diameter and carry about 200 shovels, each capable of lifting about a cubic foot of material, so that each revolution of the drum will carry up some seven to eight cubic yards of sand or mud, thus rapidly and effectively deepening channels or removing sandbars at the mouths of rivers, etc.

AN IMPROVED RECORDING THERMOMETER.

The instrument shown in the illustration indicates and records the slightest variations in temperature. The record is made on a paper chart carried by a disk, the chart containing fourteen divisions divided into hours for each day and night, and the disk being rotated by a fine eight-day spring clock movement. This thermometer is made with the following ranges Fahrenheit, according to the purpose for which the instrument is to be used: From 50° below zero to 80° above; from 20° below zero to 110° above; from + 70° to 200°, and from .0° to 260°. The clock is fastened to an iron frame constituting the backbone of the instrument, A being the clock arbor, C the clock box, and W W winding arbors. D is the ink pen, three or four drops of the prepared ink furnished lasting a week, and L L is the recording lever, S S being adjusting screws. On the arbor that carries the lever are two small arcs, F F, connected by fine platinum wires, P P, with the metallic thermometer strips, N N. These strips are each made according to the recognized method of two metals suitably fastened together, one of the metals expanding more than the other, and causing the compound strip to bend in one direction with an increase of temperature and in the other direction with a decrease of temperature. Being thin and long, they present a large surface to the air, and are, therefore, very sensitive to changes of temperature. X X represent the position of adjusting screws for fastening the instrument in place or in a packing box. These instruments, as manufactured, are standardized and warranted to automatically make a continuous record of temperature without error or omission, and cannot fail to prove of high value in very many places, as in theaters, churches, clubs, dwellings, hotels, hospitals, schools, asylums, greenhouses, breweries, glue works, dry kilns, thread mills, or wherever evenness of temperature is desirable and an effort is made to keep at or near a certain standard. They are especially desirable in the drying rooms of manufactories, in breweries, glass works, glue and varnish factories, etc.

Where desired, an electrical attachment is furnished in connection with the thermometer, by means of which an alarm is given at a distance when the temperature rises above or falls below a predetermined point. These instruments are manufactured by the Draper Manufacturing Company, No. 152 Front Street, New York City.

INSTRUMENT COMPLETE.

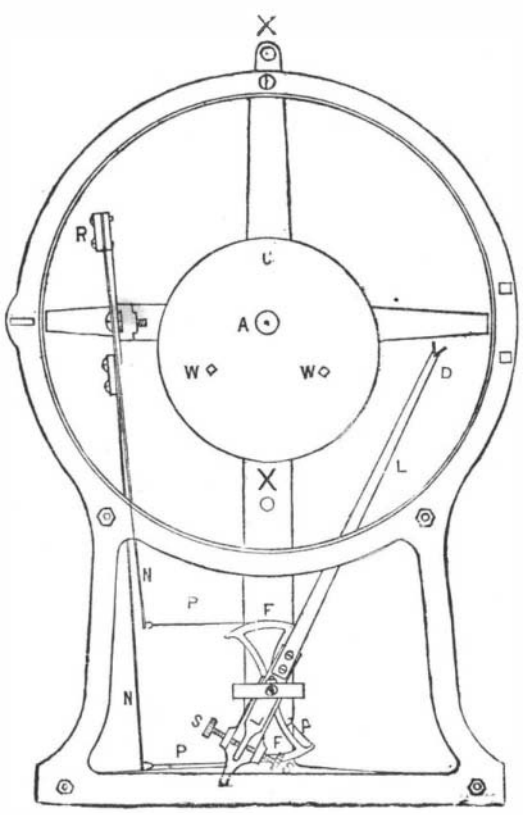
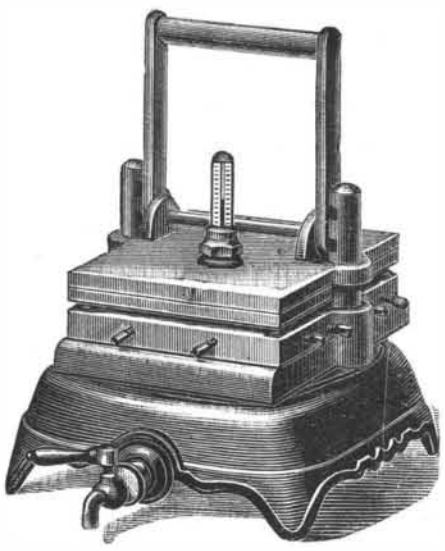


DIAGRAM SHOWING PARTS.

DRAPER'S RECORDING THERMOMETER

A COMBINED RUBBER STAMP VULCANIZER AND PRESS.

With the improved means shown in the illustration, the old, slow screw press movement, in making rubber stamps, is dispensed with, and the quick cutting blow of a die punch with lever movement is substituted, producing a sharper, better face on the letters of the mould, while also doing the work much more rapidly. Any kind of type, electrotypes, etc., used to print from



THE "NEW YORK" RUBBER STAMP VULCANIZER AND MATRIX PRESS.

may be moulded, giving the best results, high spaces, quads, or leads not being needed. The heat is supplied by either a kerosene or gas heater, a high temperature thermometer indicating the proper amount of heat to be applied after the raw rubber has been pressed into the mould, and the vulcanization is then effected in a few minutes. The unvulcanized rubber for making stamps is supplied in sheets about an eighth of an inch thick, as many stamps as will come together in a chase being usually made at once, to be cut apart after removal from the mould and mounted on wooden handles or self-inking frames. The advantage of a rubber stamp outfit as an adjunct to a printing office may also be a very material one, enabling rubber dies to be made from any of the kinds of type in use for the printing of jobs when the surface to be

printed on is rough or uneven, as envelopes, fans, etc. The rubber die or plate can be readily attached to a block of wood, or any old block on which a type plate has been previously mounted, and the job printed perfectly, with little trouble in making ready and the entire avoidance of loss from broken or damaged type. These vulcanizers are manufactured by the Barton Manufacturing Company, 336 Broadway, New York City. They received a medal and diploma at the recent World's Columbian Exposition at Chicago.

Photographic Notes.

Herr Valenta has succeeded in developing prints on ordinary albumenized paper, the exposure under the negative being reduced to about one-fifth of that usually required. It is even possible to print by electric, gas or lamp light. After printing, the paper is washed free from any nitrate of silver it may contain and developed in the following solutions:

No. 1.

Hydroquinone	10 parts.
Alcohol	100 "

No. 2.

Sodium sulphite	100 parts.
Citric acid	5 "
Water	500 "

For use take 5 parts of No. 1, 5 parts of No. 2, and 100 parts of water. The faint violet image, visible when the picture is taken from the printing frame, gradually becomes yellowish brown, and all the detail in the high lights appears when the development is complete, which takes about ten minutes. Toning of the developed print may be effected by immersion in the bath given below:

Sodium hyposulphite	200 parts.
Ammonium sulphocyanide	25 "
Alum	30 "
Acetate of lead (10 per cent solution)	40 "
Water	500 "

Heat the solution to 60 degrees C., filter, and add 50 c. c. of

Chloride of gold	1 part.
Water	60 "

Allow the prints to remain in the solution until the desired color is obtained. Ten minutes will usually be required.

A feature of the defense in the suit brought by the owners of the British steamer Winchester, in an admiralty court in London, to recover salvage from the Dutch steamer Maasdam, was the introduction of photographs taken at the time the Winchester took the Maasdam in tow. These plainly negatived the plaintiff's claim that the weather at the time was severe, and that the latter vessel was in great danger. In disputed cases of this kind the value of properly authenticated photographs in a court of law is becoming well established.

Messrs. Cross, Bevan & Beadle have recently patented a new substance, made by soaking cellulose fiber in a 15 per cent solution of caustic soda and then exposing the resulting compound to the action of carbon disulphide vapors for three hours in a closed vessel. A yellowish mass is formed, which gives a solution of great viscosity when dissolved in water, and from which it is precipitated by the addition of alcohol or salt and water. Its solubility is destroyed by heating to 90 degrees C., which converts it into a horny, structureless mass of cellulose, somewhat hygroscopic and probably suitable for a support to the sensitive photographic film. This may eventually replace celluloid. It is possible to coat a glass plate with the solution and then precipitate upon it the insoluble film by means of salt and water and subsequent heating. Any adhering chemicals are readily removed by washing.

We quote the following from a communication which we have recently received from Mr. C. T. Chesterman, of St. Petersburg, Russia: "The method of three-color printing, which has received such impetus of late, must be regarded as a decided advance on ordinary chromo-lithography in the reproduction of water color drawings, as, owing to the reduction in the number of printings necessary to obtain the end result, a mat surface is obtainable. This is not possible where twelve or more colors are superimposed, unless recourse is had to magnesia dusting, which, however, mars the effect of most colors. On the other hand, great care must be exercised in the selection of the pigments, otherwise the pictures will be far from being joys forever, as a partial fading of one color will have such a degrading effect upon the whole as to bring the process into disrepute. Where a large number of colors constitute the whole, a slight fading is hardly perceptible. Yet we see, from time to time, some sorry specimens of chromo-lithography. It behooves all those, therefore, working the three-color system of printing to thoroughly investigate the color and stability of their pigments before employing them in actual work."

We have received from Messrs. Husnik & Hausler, Prague, an excellent photo-chromotype printed in three colors. The greens are remarkably pure and bright, but the orange tones are a little too red. We have also the three separate color prints in red, green, and yellow, which, when combined, form the finished print. The original process has been perfected by this firm, who have succeeded in making the marked improvement noted in the rendition of the greens.

Dr. Schottlander has described a curious colloidal form of gold containing basic acetate of cerium, which is completely soluble in water. The solution is violet-red to carmine-red, and so intense is the color produced that 1 part in 500,000 is distinctly visible. The solution may be obtained either by precipitating a solution of cerous salt mixed with gold by means of caustic potash and dissolving the black precipitate produced in hot dilute acetic acid, or by boiling a solution containing the proper quantities of cerous acetate, gold chloride, and sodium hydrate. Sodium acetate precipitates a violet-red deposit from such a solution containing all of the gold and some of the basic cerous acetate. The precipitate, when dried, is an amorphous, bronze-colored, glittering mass, soluble in water, and bears a certain resemblance to Carey Lea's soluble silver.

According to R. E. Liesegang, negatives stained by development with para-amidophenol may be bleached by soaking them in oxalic acid and exposing them to the sunlight for two hours. A concentrated solution of sodium sulphate has a similar action, and the exposure to sunlight is unnecessary. Citrate of tin solution removes the yellow stain incident to pyro development, and citrate and acetate of tin partially bleach those stained with amidol. As both these latter agents (citrate and acetate of tin) are solvents for gelatine, considerable care must be exercised in using them.—*Anthony's Photo. Bulletin.*

Injuries to Cotton by Ginning and Packing.

It goes without saying that raw cotton is treated in a most reckless manner, not only in the gathering, but in the ginning and packing, It is well known that cotton fibers are extremely tender; the mean diameter of the fiber measures from 1·1185 up to 1·1562 of an inch, in other words it takes from 120,000,000 to 140,000,000 to weigh 7,000 grains. One fiber weighs only $\frac{1}{16000}$ *part* of a *grain*, therefore, one can readily perceive that very careful treatment is most desirable in the different processes, but, on the contrary, it meets with so much torture from the moment it blooms into maturity on the cotton plantation, all through, by submerged river boats or railway carriage, until it is dumped down on the floor of a cotton mill, that it seems as if all combined to get rid of an evil spirit. Ginned cotton when wet, or even in anything like a moist condition, proves the greatest trouble that an unfortunate carder has to contend with. It is all very well to preach patience, but not easy for a distracted man to practice it, when, after having his machinery, that has previously been giving ample satisfaction and comfort, disorganized, he finds his best efforts rendered null and void by a brand of cotton, such as we have described, *licking* up on the cylinder and otherwise baffling every attempt to deal with it. Few but those who have to suffer know the difficulties, and, of course, the carder becomes the scape-goat, until his life is scarcely worth living. This system of things has gone on from the far-away past to the present. Operatives have a very expressive *slang dictionary* of their own in which alone they can give vent to their feelings. Why should nearly a century of improvements have passed and leave us still almost where we began? What is the use of improving the carding and spinning machinery—the tail almost of the manipulation—when the head and front of the offending element are almost "improved backward"? The one word "*saw*" in connection with the initial process is quite sufficient to indicate the usage this delicate fiber receives, apart from all other loose practices. Here we have, at the very first step, the destruction of nature's gift to *cotton—the twist;* it vanishes the moment the saw is applied. On the very same principle that the twist can be rubbed out of a thread or piece of twine by friction, so is cotton fiber ill-used, torn, and cut, particularly when damp, but who cares—"sufficient for the day is the evil thereof!" "Get it away!" "Liverpool must see to it!" What care we! Let us fairly and squarely grasp the condition of things. Cotton baled damp and probably having to lie for a considerable time here and there, will, when opened, be in lumps—matted and mildewed—a precious state of fiber from which to make decent fabrics, persecuting every individual that has to handle it, sending weavers home ill, and causing the discharge of first-class finishers. It would not not be far fetched to say that *cotton in this condition just diminishes one quarter of its weight*—a very economical idea of business—paying a certain price per pound of 16 ounces and getting only 4 ounces for actual use, and if, as often is the case, the material is short in the fiber and the windows of the blowing room are accidentally opened, it will fly away to where it came from. The United States spinners and manufacturers are loud in their complaints of the rubbish, miscalled cotton, which they have to contend with, so that our grievances in this respect are not without a real foundation, but, there is no doubt, we get the worst samples.

In the packing process the fibers are seriously injured, because of the sand and trash mixed up with the cotton. The amount of compression would be of little consequence if the cotton was thoroughly cleansed previous to packing, but this point is "more honored in the breach than in the observance." Now, with many subjects, we can theorize, or grumble, and talk in public, and take to our last and favorite resource—the formation of an inquiry committee, which leads to, and ends with, the inevitable public dinner, yet the dirty, adulterated cotton arrives—the plague of our lives as operatives—just as usual. Each quality of cotton has its own peculiarity in length, fineness, etc. Now length and its continuity are the tests of the finished yarns and fabrics. As the character of the work done in carding will inevitably decide that of the ultimate production, so must the character of the work done by the machines preceding carding influence, to a great extent, this operation. If, then, the raw cotton material could be delivered to the spinner carefully gathered, dried, and picked, all the preparation before carding would be very much reduced, and costly, tedious processes might be well dispensed with.

Genius Wanted in Agriculture, Not in Weapons of Destruction.

I am exceedingly doubtful whether all of the genius exercised in agricultural implements since the displacement of the old scythe for mowing grass by hand, and the sickle for reaping and the hand flail in thrashing grain, will compare with that exercised in the production of new firearms since the old flint locks and smooth bores of our earlier days.

The percussion cap has taken the place of the flint. The revolver, the percussion cap, the repeater, the self-cocking hammer, the Sharp and Winchester rifles, and numerous breech loaders, with all of their minute and ingenious contrivances and appliances, are among the wonders of invention.

Our own Patent Office is a vast laboratory for the scientific researcher. I have frequent occasion to examine in our Patent Office for various prior inventions, and I think if there is anything of great human need that is really neglected, it is the production of new agricultural inventions. Human existence depends on agriculture. As I have journeyed over our vast domains, and those of modern Europe, France, Germany, England, where production has been more than doubled within less than a century, according to the best authorities, still they are far behind what science may yet do.

When we view the old wooden sailing vessels of the Revolution, and even those of our war of 1812, when Oliver H. Perry won his great victory on Lake Erie, when he wrote, "We've met the enemy and they are ours," and it took six weeks for it to reach Washington, our capital, and find that now a man can talk through the telephone, or send it by lightning, we see what science has done in respect to means of communication.

Now look at one of our nickel-clad armor-protected destroyers, surrounded by torpedo protectors or nets, then on the deck a wire gun screen around the gunners, woven of a wire so that the enemy can be seen through it, and yet, as has been proved, that at five paces a Minie ball, a sample of which I have in my possession, would not pierce it, and still the Winchester that threw it would pierce a five inch white oak plank at half a mile distance.

I confess that I am too much of a Quaker to study on the ways of destroying human life. I am too much of a peacemaker to rack my brain—what little I have—in trying to get up something to burn and destroy. I hope for a still higher civilization, "when nations shall have war no more;" when human genius shall be more fully employed in developing the arts of peace, and especially of agriculture, which is the foundation stone of all human industries. J. E. EMERSON.

London Pavements.

La Semaine des Constructeurs quotes from a report of Mr. Foulger, the Chief Engineer of the London Gas Company, some rather startling information about the condition of the London streets. Many of the streets are paved with wood blocks, laid on a stratum of concrete, which forms a sort of arch across the street. This concrete has become very hard, so that it is quite capable of sustaining the traffic without the support of the earth beneath it; and it seems that in course of years the soil, which is loose and soft, has settled away from beneath it, so that, for example, in Oxford Street it was found, in making some repairs, that a man could crawl in between the underside of the concrete arch forming the substratum of the pavement and the surface of the soil under it. Except for the danger of a sudden collapse of the arch, this subsidence of the soil would not be a serious matter, were it not for the fact that the space between the concrete and the soil is found to be filled with a mixture of gas, which has escaped from the street mains, and air; and if the mixture should attain explosive proportions, which might easily happen, a short-circuit of an electric current, or an incautious excavation, might result in blowing the street into the air.