PHOTOGRAPHIC NOTES.

Correct Color-Tone Photography with Ordinary Gelatine Bromide Plates.—In a recent communication read before the Franklin Institute at Philadelphia, from advance sheets of the *Journal of the Franklin Institute*, Mr. Fred. E. Ives relates the following concerning some interesting experiments with color screens, intended to be located in the camera, behind the lens:

Chlorophyl-stained collodion bromide emulsion plates have been made four or five times more sensitive to spectrum red than to blue. It has been estimated that ordinary gelatine bromide plates are one hundred times more sensitive to blue than to red. The *relative* red sensitiveness of the chlorophyl-stained collodion plates is, therefore, probably four hundred or five hundred times greater than that of ordinary gelatine bromide plates. But the most rapid ordinary gelatine bromide plates are one hundred times more sensitive to ordinary diffused daylight than the collodion emulsion plates, and it would, therefore, appear that the absolute red sensitiveness of the very rapid gelatine plate should be one-fifth as great as that of the very slow chlorophyl plate. By recent experiment in photographing the lime-light spectrum, I have found this estimate to be very nearly correct for some makes of extra rapid gelatine bromide plates.

What, then, is to prevent us from making correct color-tone photographs with very rapid ordinary gelatine dry plates? The difficulties, although apparently great, are not insurmountable, as I shall show; but the exposures are necessarily so long that the method is not available in many cases where the regular isochromatic processes can be successfully employed. I have calculated that, in order to secure correct color-tone without a color-screen, it would be necessary to have plates about ten times as sensitive to spectrum red as to blue; if this estimate is correct, the ordinary rapid gelatine dry plate is relatively one thousand times too sensitive to blue; and in order to secure correct color-tone with such a plate, it would be necessary to cut off $\frac{999}{1000}$ of the blue light, and green and yellow in due proportion. It is very easy to cut off a large portion, or all, of the blue light, but it required a great deal of patient experiment to produce a color-screen that cut off just enough of the blue, and also of the green and yellow. I accomplished this by a mixture of aniline color solutions in the plate-glass tank which I recommended for color-screen purposes in 1879. My first trial exposures were made on the lime-light spectrum. I commenced by adding aniline yellow to water in the tank, a little at a time, until so little blue light was transmitted that it produced very much less action than the red; I then added aniline red until the green acted but little more than the blue, and aniline violet to slightly reduce the action of the yellow. An exposure made in the camera, using this color-screen and a M. A. seed plate, proved that my calculations were very nearly correct. I was only obliged to add a little more yellow and red to the color solution to secure correct color-tone in all the colors of a bright chromo, which I use as a test object. *With exposures five times longer*, I have secured results apparently equal to those obtained with my chlorophyl-eosine plates and yellow screen.

The result which I obtained cannot be even approximated by means of a screen of any single-color solution that has been tried, and I believe this to be the first specification of the production of a color-screen actually capable of securing correct color-tone with ordinary plates.

Purple-Brown Stains in Gelatine Bromide Prints.—We recently had bromide paper prints shown to us for examination which had on their surface irregular-shaped stains, varying in size from one inch wide to half an inch by from two to four inches long, of a peculiar purplish brown tint. The operator had used the best of care, having followed the printed instructions to the letter, but was troubled now and then with the stains. We ascertained by experiment that the sole cause of the stains was due to the injection, either from the fingers or accidentally, of an infinitesimal amount of hypo. into the water or vessel in which the sheet was dipped prior to development.

It is well known that any trace of hypo. on the fingers coming in contact with a corner of a bromide sheet will cause the corner to immediately blacken when immersed in the ferrous oxalate developer.

This same reaction occurs, only much slower, when the amount of hypo. present is still less, resulting in the formation of the peculiar stain spoken of. In working gelatine bromide prints, it is very necessary that no trace of hypo. be upon the fingers or in the dish of water in which the prints are first wetted.

AN explosion of nitro-glycerine occurred July 2, in the mixing house of a dynamite factory at McCainsville, N. J., whereby ten men lost their lives. Only little bits of their bodies were afterward found, the woodwork of the house was mostly reduced to fine powder, and small craters in the earth marked points where most of the nitro-glycerine is supposed to have been.

James Muspratt.

James Muspratt, the founder of the alkali industry, died at Widnes, Eng., May 4, at the age of 93 years. He was born in Dublin, August 12, 1793. At 14 years he was apprenticed to a wholesale druggist and apothecary, where he acquired some practical knowledge of chemistry. With a small capital he commenced the manufacture of acetic and hydrochloric acids and other chemicals, and some time afterward, in partnership with a Mr. Abbott, that of prussiate of potash. In 1822, dissolving the partnership, he removed his plant to Liverpool, where he began the erection of lead chambers for the manufacture of sulphuric acid, with the intention to practically work out the Leblanc process of manufacturing soda. His Liverpool works soon becoming inadequate to the demand, he erected more extensive works, in partnership with Mr. Gamble, at St. Helena. Expelled from both places by expensive lawsuits for damages, he went to Flint and afterward started works at Widnes, where about 350 men are employed under the direction of his son, Mr. E. K. Muspratt, in the manufacture of soda ash, sulphate of soda, bleaching powder, caustic soda, sulphur, brown vitriol, rectified vitriol, chlorate of potash, hydrochloric acid, and chloride of magnesia.

Weights and Strength of Girders.

In the large tubes of the Britannia bridge, the weight of the top and bottom flanges is nearly equal, while the sides are a little more than one-third the whole weight, viz., 37 per cent. From these considerations, it is very easy to arrive at a quick method of estimating the weight of any given girder. The sectional area at the center of one flange being obtained, the weight per foot is known; one-fourth of this, at least, may be saved by proper arrangement of the materials, and the weight of the whole beam will be three times this result. The Board of Trade limit the strain on wrought iron to 4 tons to the square inch in compression and 5 tons in tension. This would make the bottom flanges of beams lighter than the top, were it not for the weakening effects of rivet holes; it is therefore generally correct to make the bottom flange the same gross area as the top. By dividing the strain in tons in the center of a flange by 4, we obtain the sectional area; multiplying this by 3⅓ pounds, the weight of an inch square bar a foot long, we obtain the weight per foot of the flange; multiplying this into 3, we obtain the weight per foot of the beam, supposing its sections to be uniform; and finally, multiplying by ¾, we get the average weight of a beam, the flanges and lattices of which are proportioned in some degree to the varying strains. If we assume the depth of a beam to be 1 foot in 12·8 feet, a very good proportion, this formula becomes

$$\text{Weight per foot} = \frac{W \times 12{\cdot}8 \times 3\tfrac{1}{3} \times 3 \times 3}{8 \times 1 \times 4 \times 4} = 3W.$$

Or, in other words, multiply the distributed load in tons a beam is required to carry by 3, and the result is the weight in pounds per foot of the beam.—*The Architect.*

Efficiency of Small Water Motors.

Nowadays, when so many of the small cities throughout the country are supplying themselves with water works, it seem time to notice a class of small motors in which the water pressure can be utilized to develop power for driving such various kinds of machinery as are usually operated by hand. Sewing machines for clothing and dressmaking establishments and private houses; small lathes and drills for light manufacturing purposes and repair shops; in groceries for roasting and grinding coffee; in restaurants and dining rooms for actuating fans for ventilation and fly screens; and in barber shops for revolving hair brushes, and so on through a long list of uses for saving hand labor.

Some of these take the form of water engines, especially when adapted to blowing organs, or producing a reciprocating motion. Others are models of turbine wheels, while many of these motors are simple forms of impact and reaction wheels, wherein the power is derived from the direct impinging of a small jet of water at a high velocity against a series of cupped floats or plates attached to the arms of a wheel inclosed in a case, the waste water flowing off to the sewer after having spent its force in causing the wheel to revolve.

Such a motor is very simple in construction, and consists of a wheel with the series of floats attached on its periphery, inclosed in a chamber to prevent the dashing of the water; and as this revolves in the case without contact, the only parts liable to wear are the two journals of the supporting shaft, which, projecting through the sides of the chamber, are provided with oil boxes and are easily cared for. These ends of the shaft are fitted with pulleys, from which motion is communicated to a line shaft by belting or cord. A very pretty application shown in a grocer's window was one of these motors. The shaft on one side was provided with a pulley, from which was driven a set of coffee grinders, while from a crank attached to the opposite end a connecting rod worked a machine for slicing smoked or dried beef.

The motors are very handy. They are always ready when their services are required for either long or short duty, and they never get tired. A moment given to open the water valve, and they are in motion. Simply closing the same valve, and they are motionless, and while at rest they are no expense. In this respect they have the advantage of both steam and hot air engines, which require the continual keeping up of the steam pressure in the boiler or of heat in the furnace, and also of gas motors, which are much more complicated pieces of mechanism, and require better mechanical skill and ability in their attention and care.

In fact, they are, because of their extreme simplicity and non-liability to get out of order and wear out, peculiarly adapted to fill the demand for help where a constant water pressure and supply can be obtained.

In regard to the expense of operating such motors, that of course depends upon the total hours per day they are run and the load they are called upon to carry. In their proportion of parts, the nozzle from which the water issues for discharge against the floats will range from one-eighth to one-fourth inch diameter; the size will depend upon the working head or water pressure in connection with the amount of power required. The greater the pressure the smaller the nozzle, and less water required to develop the power.

Take, for instance, a motor having a nozzle of three-sixteenths of an inch diameter with a working head of 60 feet. The maximum theoretical discharge from an orifice of three-sixteenths inch diameter under a head of 60 feet would equal 44·68 pounds of water with a velocity of 37·29 feet per minute. Allowing for the friction of vent, the actual effective discharge would be reduced to, say, 32 pounds of water delivered per minute.

$$32\text{ lb.} \times 37{\cdot}29\text{ feet per minute} = \frac{119{\cdot}328}{33{\cdot}000} = 3{\cdot}3\text{ horse pow-}$$

er; deducting from this 40 per cent for loss of efficiency, and it leaves, say, two horse power as the maximum practical effect from the use of 32 pounds of water per minute, or $\frac{32}{2} = 16$ pounds of water $\times 60 = 960$ pounds per hour; $960 \times 10\text{ hours} = \frac{9{,}600}{625} = 153\frac{6}{10}$ cubic feet per day; $153{\cdot}6 \times 300$ working days = 46,080 cubic feet per year. 46,080 cubic feet × 2 mills per cubic foot will amount to 92·16 dollars per year for the water to produce an average of one horse power per hour. That would be for constant power for ten working hours and three hundred working days. In case the motor was at work only part of the time, then the expense would be only in proportion to the hours run, while if the pressure was double and the cost per cubic foot remained the same, then the expense would be less, and so on.—*American Engineer.*

Health in Connecticut.

The May report of the State Board of Health for Connecticut says:

In nine cities, representing a population of 276,000, or about three-eighths of the population of the whole State, the death rate was 14·02 to the 1,000 people, as compared with 18·9 in the month of April in the same cities. So far as this estimate may stand for the general health of Connecticut, it shows a very gratifying improvement over the health of the preceding month.

While about the same list of fatal diseases are reported from the various towns, the marked diminution in their fatality is to be noticed. The most fatal diseases in April were consumption and pneumonia.

In April there were 74 fatal cases of consumption in the above nine cities, but in May only 60. In April there were 73 fatal cases of pneumonia in the same; but in May only 18.

How much a general improved state of health is to be attributed directly to warmer weather, and how much indirectly to the escape from the confined and unwholesome air of houses, which warmer weather permits, is a very difficult question to solve.

The open air, free and pure, is an acknowledged essential of health. House air is often foul and even poisoned. There is much reason to think that open doors and windows, which warm weather allows, has more to do with diminished sickness than a merely higher temperature.

For Staining Bricks.

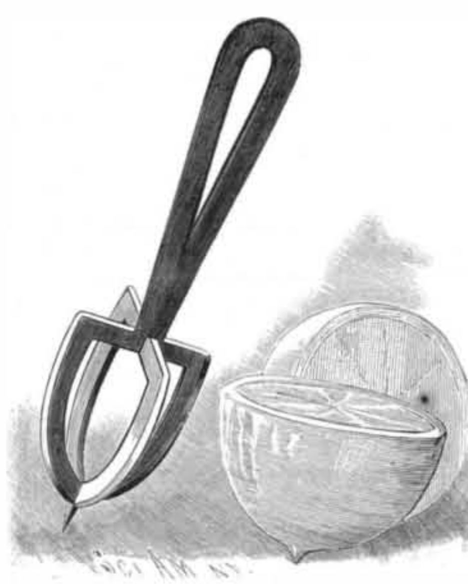
For staining bricks red, melt one ounce of glue in one gallon of water; add a piece of alum the size of an egg, then one-half pound Venetian red and one pound of Spanish brown. Try the color on the bricks before using, and change light or dark with the red or brown, using a yellow mineral for buff. For coloring black, heat asphaltum to a fluid state, and moderately heat the surface of the bricks and dip them. Or make a hot mixture of linseed oil and asphalt; heat the bricks and dip them. Tar and asphalt are also used for the same purpose. It is important that the bricks be sufficiently hot, and be held in the mixture to absorb the color to the depth of one-sixteenth of an inch.

Novel Way of Advertising.

A lady going north a few days ago, says a Chicago newspaper, was stopped by a rather shabbily dressed woman, who inquired where Schultz's dye house was. "I do not know," was the reply. "Well, why don't you know? It's over corner Illinois and Clark Streets," was the apparently disgusted reply. Subsequent developments proved that this has become a new mode of advertising. It is indeed a novel one, and one that certainly leaves an impression on the person questioned

FRUIT PULPER.

The object of this invention, which has been patented by Mr. Frank W. Bradley, whose address is P. O. Box 2,015, Denver, Col., is to provide a simple implement for easily removing the pulp from lemons, oranges, and similar fruit. The curved blades are united at the bottom and form a point, and their opposite ends are connected by arms with the handle. The curvature of the blades is approximately the same as that of the inside of the peel of a lemon or orange, so that when the pulper is inserted in the pulp of one-half of the fruit, and turned, it will remove the pulp without its being flavored with the oil of the peel. The blades may be made detachable from the handle, if desirable.



BRADLEY'S FRUIT PULPER.

OPERATING MECHANISM FOR RAILWAY SIGNALS.

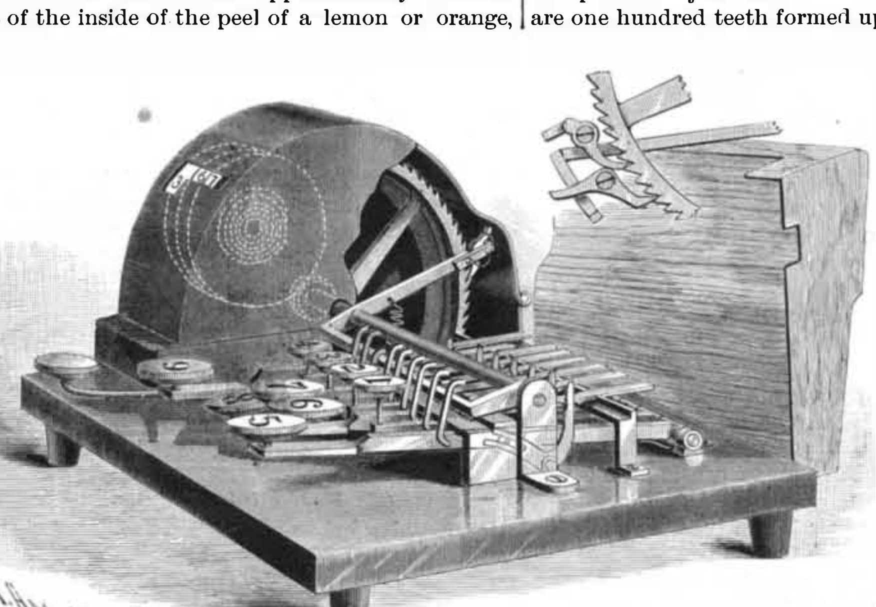
By means of the construction herewith illustrated, a single signal can be operated by a single line wire from any number of points desired, but which, having once been set to "danger" from one or more of the stations, cannot be set to open the line until all of the signal stands have been moved to "safety." In the ordinary forms of construction heretofore in use, the signal has been operated by a wire direct from the signal stand; but by this invention there may be interposed as many different signal stands as desired, at such distances apart as may be most convenient, one of these interposed signal stands, as shown in the illustration, consisting of a lever pivotally mounted on a standard, and connected by a pitman with the short arm of another lever, through which the pull of the wire is transmitted to a sliding bar, riding in slots, and thence through another pivotal lever to the signal. At each of the stands there are racks with limit pins or stops to prevent the passage of the lever arms; and the upper arm of the lever, to which is attached the wire communicating directly with the signal, has several holes, the throw of the lever being determined by attaching the wire at a proper distance from the fulcrum. When the lever is released at any one of the signal stands, it permits the levers to change and the wire to slack from such point sufficient to drop the weight at the signal post. As the weight falls, it displays the danger signal, the full rise of which is easily insured by the compensating lever. After the line has thus been closed by the setting of the danger signal, it cannot be again opened until all the parties who have given the danger signal set the levers at their respective signal stands for safety. By such an arrangement of operating mechanism, it is claimed that the number of distinct signals required for a section of road can be greatly reduced, and thus effect a saving that will be readily appreciated by railroad men.

MARTIN'S OPERATING MECHANISM FOR RAILWAY SIGNALS.

This invention has been patented by Mr. Peter N. Martin, of Madalin, N. Y., to whom, or to Mr. Miller Longbottom, of No. 7 Fulton Fish Market, New York city, should be addressed all communications relative thereto.

ADDING MACHINE.

In the machine herewith illustrated there are nine levers, each provided at its outer end with a disk marked with a numeral. When one of the levers is depressed, a pawl carried upon the end of an arm passes up over as many teeth of a ratchet wheel as are indicated by the numeral of that particular key; the arm carrying the pawl is then drawn down by a spiral spring and turns the wheel, which is held from being turned back by the friction of the pawl by a second pawl pivoted to the bed plate. The wheel is loosely mounted upon the end of a shaft extending across the bed plate and journaled in suitable standards. There are one hundred teeth formed upon the wheel, and upon its rim is formed an annular flange marked with numerals from 1 to 100. To the outer end of the hub of the wheel is attached a small pinion wheel, with which meshes a gear wheel having a rim marked with numbers 1, 2, 3, and so on, as many division marks being used as the teeth of the gear wheel are multiples of the teeth of the pinion, so that this rim will indicate the number of revolutions of the ratchet wheel, and consequently the number of hundreds in the sum. With the journal of the gear wheel is connected the end of a spring, so arranged as to be coiled up by the forward revolution of the wheel, and having sufficient strength to turn the ratchet wheel and gear wheel back to the zero points when the pawls are raised, which is accomplished by depressing the lever having a blank disk. The mechanism is covered by a casing having apertures over the zero marks of the wheels, in order that the sum can be readily read. In using the machine, the keys representing the figures to be added are successively depressed, and the sum of the column of figures can be read through the apertures.

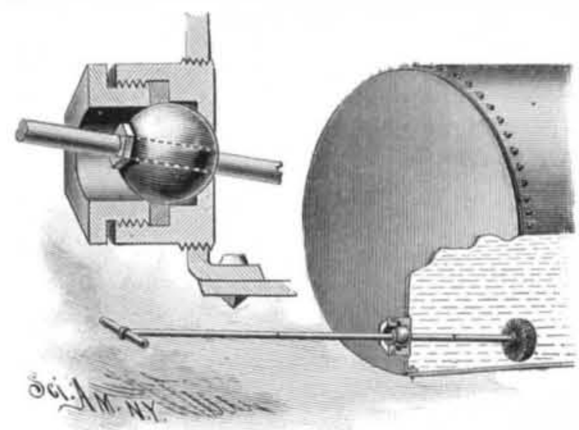


LINDHOLM'S ADDING MACHINE.

This invention has been patented by Mr. Peter L. Lindholm. Further particulars can be had by addressing Messrs. Lindholm & Peterson, of Franconia, Minn.

BOILER SWEEPER.

A sweeper for cleaning scales and sediment from boilers, tanks, and stills, that can be used while the pressure is on, is shown in the annexed engraving. In the head of the boiler, and as near the bottom as possible, is screwed a pivotal universal joint connection for the sweeper rod. The construction of the connection is clearly shown in the sectional view. The sweeper rod is made in sections screwed together to allow of its being drawn out and disconnected to prevent corrosion.



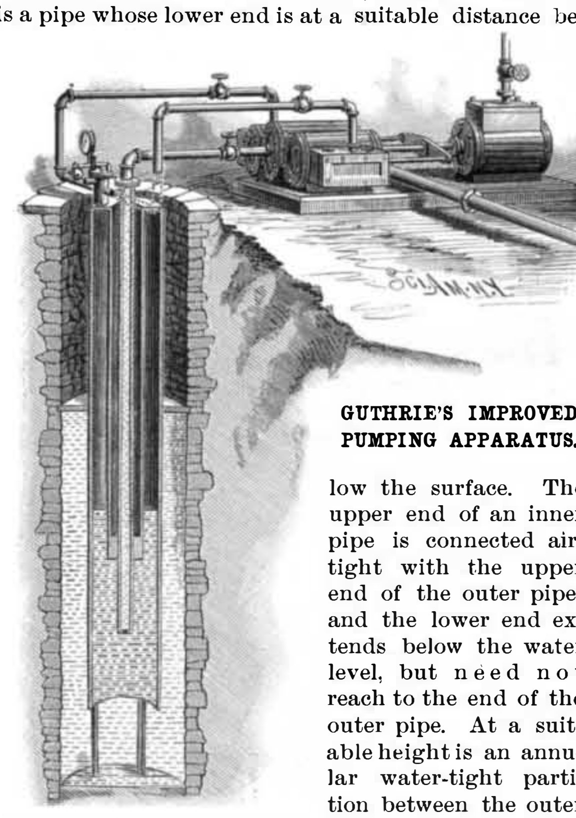
LEVI'S BOILER SWEEPER.

The last section remains in the ball, with the brush drawn up so as not to rest on the bottom and endanger its burning, and this section is made as short as possible, to prevent it projecting too far at the front of the head. With this device every portion of the bottom of the boiler can be reached and cleaned by the brush, and this sweeping operation can be performed when the boiler is under pressure, so there need be no loss of time.

This invention has been patented by Mr. William T. Levi, of Charleston, W. Va.

IMPROVED PUMPING APPARATUS.

Extending into the well, cistern, or other reservoir, is a pipe whose lower end is at a suitable distance below the surface. The upper end of an inner pipe is connected air-tight with the upper end of the outer pipe, and the lower end extends below the water level, but need not reach to the end of the outer pipe. At a suitable height is an annular water-tight partition between the outer pipe and the wall or casing of the reservoir. Connected air and water tight with the lower end of the second pipe is a third one; between the second and third pipes is an air space to prevent the second pipe from being crushed by the air pressure in the outer pipe when a vacuum is formed in the third or inner pipe, whose upper end is connected with a pump cylinder as shown. To the main piston rod is attached a cross-bar, to the ends of which are secured piston rods of two cylinders, placed at opposite sides of the pump cylinder, so that the suction pump and the two air force pumps at the sides will be operated from a common piston rod. The air chambers of the air pumps are connected with the air-tight cover uniting the upper ends of the first and second pipes. The connecting pipes are provided with proper valves. When the engine is operated, the liquid is drawn by the pump and forced through a discharge pipe, while



GUTHRIE'S IMPROVED PUMPING APPARATUS.