Correspondence.

How to Polish Photo Prints.

To the Editor of the Scientific American:

As burnishing oftentimes adds much value to a photographic print and increases its detail, a burnishing device of some sort is a useful adjunct to any photographic outfit. But a good burnisher is expensive, and it scarcely pays an amateur to invest in one, especially since such excellent paper can now be purchased, which needs but little additional polish after it is dried. I have obtained very good results on omega and albumen papers by employing a polishing iron, such as is used for laundry work. This should be brightly nickeled and have one end rounded. It should be used quite hot, but if too hot it is likely to scorch the print. Before polishing, the print must be lubricated by rubbing it with a cloth moistened with a strong alcoholic solution of castile soap. The iron must be kept constantly in motion and be firmly pressed down on the print. By a little patient use of the iron a fine polish can be given, even to an albumen print.

I have found such an iron especially useful in straightening out dry mounts so they would lie flat. This can readily be done by applying the iron to the reverse side of the mount. Place the mount, print side down, on a piece of clean blotting paper. With one hand press the iron firmly on the card, and with the other hand grasp the end of the mount and draw it out from beneath the iron, pulling it upward at the same time, so as to bend it back over the rounded end of the iron. If the bend is too sharp, there is some danger of injuring the print. I have found this method especially useful in straightening out mounts for albums. W. M. STINE.

Athens, Ohio, June 4, 1892.

Cyclones and Cities.

To the Editor of the Scientific American:

Scarcely a day passes in these spring and summer months but the wires bring us news of dreadful cyclones, tornadoes, or hurricanes, devastation following in their wake; villages are wiped out, with great loss of life and property. At present there seems no remedy, but may there not be at least a partial one? Occasionally the larger cities are visited, and the dread is of some tremendous catastrophe of this kind. Several years ago Louisville and Philadelphia, and a few days ago Chicago, were visited, but it is to be noticed that these storms seldom reached the center of these large cities, confining their fury to the outskirts.

Why is this so? And why is it that larger cities are always likely to be safer from great wind storms than small towns and villages? In the opinion of the writer there are several causes:

First, large cities have better built and stronger houses; second, the outskirts act as a brake for the mass of the city; but the great cause of safety is the large volumes of gases generated from the manufacturing establishments located in and around large cities, as well as the multitude of chimneys of dwellings pouring forth their quantum. The general volume of all this gas acts as a buffer if the storm is very severe, or deflects it if simply a "twister," or may entirely neutralize the effect of any storm prevailing on the outskirts. This city, surrounded by high hills, with three rivers as conductors or channels for storms, with its enormous volumes of gases, far greater than produced in any other American city, is, I think, pre-eminently safe from great storms. Other large cities—New York, Boston, Philadelphia, Baltimore, Chicago, St. Louis—should be safe in proportion to their size.

As a theory—I do not present it as a scientific fact—is it not worthy of investigation by our weather bureau?

Comparisons could be easily made of velocities within and at points surrounding cities, probabilities calculated, and possibly safeguards suggested. Oil on troubled waters has saved vessels. Might not oil or gas tanks fired at approach of cyclones save our Western towns from unnecessary destruction? THOS. N. MILLER.

Pittsburg, Pa., June 14, 1892.

[The range of intensity of our great cyclones or tornadoes seems to occupy a district bordering the Mississippi Valley and its tributaries. There is probably a meteorological condition of influence that intensifies it there, and no matter how great a city might be, if it should happen to lie centrally in the path of an intensely active tornado, such as swept through a section of Louisville, or the later ones in the Western States, it would cut a swath through it as clean as the forest examples in some of those States. A large city netted with telegraph wires and covered with metallic roofs connected with the sewerage and underground water system may largely influence the electric conditions of tornadoes, but would have little resistance beyond the weight and strength of its buildings to a direct onset of a genuine cyclone. The remedies suggested by our correspondent would always be found too late in practice. The warnings leave no time for such remedies. —ED.]

Electricity vs. Steam.

The inadequacy of all electric locomotives proposed for heavy and frequent passenger trains—for service such as must be handled on the prominent suburban railroads—has several times been referred to in these columns. We have pointed out what seems to be a lack of appreciation on the part of the electric companies and designers of the problem to be solved. We now present some definite information on this subject, to show clearly what is needed in an electric motor if it is to do the work now performed by steam locomotives in the service referred to. The data are based on the present operation of the suburban section of the Illinois Central road in Chicago, one of the largest suburban traffic fields in this country.

The lengths of the stops average about 15 seconds when the trains are not too crowded and the trainmen are alert. The trains are composed of from four to sixteen cars, according to the traffic, and the average number of cars per train is six.

The data are based on actual speed and indicator-diagrams taken from the suburban engines on the road, and are as accurate as necessary to give a perfectly safe basis for estimating the power needed to run the road by electricity. From diagrams we have calculated the average and maximum horse power between stations required to pull a train, and the average and maximum horse power required to run all the trains. The results are given in what follows, together with the amount of coal consumed per useful horse power absorbed in hauling the cars and their lading per hour.

Average number of cars per train	6
Maximum number of trains on line at any one time	14
Maximum number of cars on line at any one time	84
Average horse power required between stations to overcome the inertia and the friction of the trains, as shown from the acceleration diagrams	390
Maximum horse power required between stations to overcome the inertia and the friction of the trains, as shown from the acceleration diagrams	510
Average pull on the forward drawbar of the train in pounds, taken as an average of the pull between stations	7,750
Maximum pull on drawbar at starting, pounds	14,000

If all the trains are running exactly according to the large diagram, which accords with the time table, then the following averages and maximums may be deduced:

Average aggregate horse power for all trains on the line	2,600
Maximum horse power for all trains	4.500
Aggregate pull on forward drawbars, average pounds	51,700
Aggregate pull on all forward drawbars, maximum pounds	108,750

If it happens that all trains are running at once, but not necessarily all starting at once, then the following is obtained:

Average horse power for all trains	6,270
Maximum horse power for all trains	7,140
Average pull for all forward drawbars, pounds	172,200
Maximum pull for all forward drawbars, pounds	196,000

The following are the averages between the hours of 5 and 6:20 P. M.:

Average number of trains on line	12·3
Average number of trains accelerating at one time	6·6
Maximum number of trains accelerating at one time	10·0
Average number of horse power hours of work done by each steam locomotive per day	2,145
Average amount of coal used by a steam locomotive in doing 2,145 hours of work, pounds	14,000
Average amount of Illinois coal used per horse power hour, pounds	6·52

The diagrams and tables give exactly what an electric locomotive will have to do in order to duplicate the work now done by steam locomotives. This is outside of all problems of switching, signaling and distribution of power. Of course, all those matters are readily settled. Where a railroad company owns its right of way, it is comparatively a simple matter to lay conductors for the electric current, and the switching of the current can be readily done. The whole question about the substitution of electricity for steam is centered around the possibility of getting a motor sufficiently powerful to do the work, and the handling of such powerful currents as would be necessary on a line like the Illinois Central, where a total of 7,000 or 8,000 horse power is needed. The business of the Illinois Central is constantly growing. The number of trains will be doubled within the next few years, and the suburban business will be extended further from the terminus. But, of course, more than one electric station could be used to supply the line, and distribution, in itself, is probably not an insurmountable obstacle. The problem that remains to be settled before much enthusiasm can be aroused among steam railroad men is that relating to the possibility of making an electric motor with power equal to that of the steam locomotive. It will be noticed that the average horse power between stations is about 390, while the maximum is 510.

The problem then is to construct and maintain an electric locomotive of sufficient weight to haul a train, one capable of evolving from 500 to 800 horse power. More than one motor to a train is practically out of the question. The exigences of excursion days, when heavier and more numerous trains are run, we will ignore for the present. It now remains for those engineers who make electricity a special study to bring forward their plans and show what they propose to do. As yet they have shown no evidence of ability to meet the serious problem we have here outlined. Many railroad men have a feeling of confidence that electric motors will some day supplant our steam locomotives, but it is in most cases decidedly indefinite, not to say superficial. This sentiment encourages the electrical inventors, and it is right that it should, but they will need something more tangible if they are to make the desired progress.—*Abstract from the Railroad Gazette.*

New Experiment in Steam Propulsion.

An interesting experiment is soon to be tried in England with a vessel provided with two screws which are arranged amidships under the bottom of the boat on plans invented by F. W. Richardson. A successful trial has been made in an old vessel, and now the company have intrusted Messrs. Cochrane, Cooper & Schofield with the order to build a new vessel specially adapted for the purpose. The vessel will have the following dimensions: Length between perpendiculars, 94 feet; breadth, 18 feet 6 inches; depth of hold, 8 feet. She is to be fitted with two pairs of compound surface condensing engines. The tube in which the propeller works is a complete tube for about five or six feet, and then it tapers down to the keel, the forward end at eleven and the after end at eight degrees. The advantages claimed by the patentee for this system of propulsion over the present stern propeller are as under:

1. Economy of power, and consequently saving of fuel.
2. Direct action between the steam and the work.
3. Enormous reduction of weight in all moving parts, together with general lightness and compactness.
4. Variable immersion, so objectionable in the present system of propulsion, will not affect the principle.
5. Immunity from rocking and straining of engines.
6. Risk of fracture of crank or propeller shaft minimized.
7. Less noise and vibration, consequently a much more comfortable passenger boat.
8. When reversed the vessel will move straight astern without divergence.
9. No swell or side-work to destroy canal banks, owing to the currents moving straight astern.
10. By altering the relative speed of the engines, the vessel can be safely navigated in the event of rudder being carried away, or steering gear disabled.
11. Safety and steadiness in the event of the ship being hove to, with perfect command under all situations.
12. War vessels can be built double ended, with power for ramming increased.
13. Greater facility for handling the ship, with full engine power for maneuvering.
14. Safety of the propeller power from harm.
15. Avoidance of risk of detention from accident and adjustment of the machinery for both screws at the same time.

Ink for Marking Bales.

Best gum arabic	10 lb.
Logwood liquor, sp. gr. 1·09	3 gals.
Fustic extract	1 lb.
Nitrate of iron solution, sp. gr. 1·37	20 fluid ounces.
Bichromate of potassium	2½ ounces.
Water	q. s.

Dissolve the gum arabic in 1 gallon of water, strain and add the logwood liquor, mix thoroughly, and let it stand twenty-four hours. Then stir in rapidly the bichromate, dissolving in 3 quarts of boiling water. Then add the nitrate of iron and fustic extract. If too thick for use, add lukewarm water until reduced to the proper consistency.

The above directions will make, if carefully followed, a jet black ink that will leave an indelible mark and will dry quickly.

If a blue black is desired, omit the fustic extract, and substitute 4 ounces of indigo extract.

When no appliance is at hand for determining the specific gravity of the logwood and the iron liquids, a sufficiently near approximation of the strength and proportions required may be ascertained by a few colorimetric trials. The logwood liquor may be conveniently made by dissolving the extract in water, and the strength can then be easily regulated.—*Druggists' Circular.*

Completion of a Cable Survey.

The United States survey steamer Thetis arrived at Honolulu on May 20 from Hilo, where she ended the survey for the cable to be put in between San Francisco and the Hawaiian Islands. The course to Hilo comprised 2,060 miles as surveyed by the Thetis, with 300 soundings, against the survey of the Albatross of 2,150 miles and 250 soundings.

The soundings were made at intervals of two, ten, and sometimes one mile apart. The deepest was 3,228 fathoms, about 245 miles northeast of Hilo, and the shoalest was 976 fathoms, at a point about 350 miles from Point Conception. Were it not for this abrupt rise, the course would have been almost level.

The route traversed by the Thetis is considered by the officers as the most practicable yet surveyed.