cember of last year, the total number of movements to and from the Grand Central terminal was, according to the official time table, 1,213. By the introduction of electric operation, the total yard train movements have been reduced by 690. It is this reduction more than anything else which has loosened up the congestion that completely disorganized the schedule during the autumn and early winter of last year.

Over and above the adjustment of the train schedule, the station and yard have been greatly improved in other respects, and notably in the reduction of noise, and the abolition of steam, smoke, and cinders. The multiple-unit trains, as used in local service, and even the large 97-ton locomotives, run with a smoothness and quietness which are very noticeable. When that greatly hoped for, but long-deferred day arrives on which the New Haven Company shall have been able to make its high-tension system work, and that company's steam locomotives shall have been withdrawn, there will be very little visible or audible evidence of the existence in this part of the city of one of the greatest terminal stations in the world.

ORIGINAL METHODS OF TONING DEVELOPED PHOTOGRAPHIC PRINTS.

BY MILTON B. PUNNETT.

The desire to obtain colors other than those given by development *per se* has led the manufacturers and users of bromide and so-called gaslight papers to resort to different methods. Of the many methods used, the one that has found the greatest application is the so-called sulphide method, of which the Velox redeveloper may be taken as a good example. About twelve years ago the writer recommended in one of the photographic magazines a similar method for obtaining sepia colors on lantern slides. Sulphide tones properly made are permanent. Sufficient time has elapsed since their introduction to thoroughly prove this. Facility of production is also in their favor. The tones are, however, not very varied, nearly always being some shade of sepia. Experiments to obtain some other permanent sulphide tone were made by the writer with what appeared to him to be a fair degree of success. It was found when finished prints made on Velox or Nepera bromide paper (I mention these papers because my experiments were confined to them) were immersed in a solution of ammonium sulphocyanate and sodium sulphide, a good purplish tone, very often equal to a gold tone on printing-out paper, was obtained.

The following formula has proved the most satisfactory of any tried:

A.

Ammonium sulphocyanate...	8 ounces
Water to make.....	16 ounces (fluid)

B.

Sodium sulphide (crystals)..	½ ounce
Water	3 ounces

Following are condensed instructions for its use:

Bath No. 1.

Solution A.....	1 ounce
Water	3 ounces
Solution B.....	1 drachm

Mix just before toning.

Immerse the fixed and washed (and preferably dried) print. The toning action begins almost immediately, ranging through the purple tones first and then into the sepias.

Allow the print to remain in the toner till the desired color is reached, then wash fifteen minutes in running water and dry as usual.

With the bath at 70 deg. to 80 deg. F., prints will tone in from fifteen to forty minutes; at 90 deg. to 100 deg. F. five to fifteen minutes will suffice, but it is not advisable to use the bath at a higher temperature than 100 deg. F., owing to its softening action on the film.

Prints developed with Velox N. A. developer tone quicker than prints developed with ordinary developer.

The rapidity of the toning may also be increased by adding more of solution B, but not more than one drachm should be added to the original solution at one time, as this would render the bath too alkaline and soften the film.

It works best when freshly mixed, and after forty minutes or so more B solution may be added.

The old bath may be kept for future toning, but before use it should be filtered or decanted to remove the white precipitate formed, and fresh B solution added, but it should be discarded when it becomes so alkaline as to affect the film.

It will be found that the toning is influenced somewhat by the character of the negative used, different degrees of density in the negative affecting the silver deposit on the print and the subsequent action of the toning solution.

It will also appear that matt papers tone more readily than the glossy, and that purple tones are easiest secured on glossy papers.

It must be confessed that the laws governing the action of this bath are not as thoroughly known as could be desired. Sometimes it will work quite rapidly, and again under apparently the same conditions it works much slower.

Further experiments have shown that its certainty of action could be greatly improved by mixing with it hypo alum toning solution, made according to the following formula:

C.

Hypo	10 ounces
Water	50 ounces
Heat to boiling and add	
Powdered common alum.....	2 ounces

Allow to stand until cold. It improves by standing.

Bath No. 2.

A	½ ounce
C	½ ounce
Water	3 ounces
B	1 drachm

When B is added the solution is clouded by the precipitated aluminium hydroxide. This precipitate does not interfere with the toning action.

This latter bath (No. 2) yields tones equal to and quite often superior to the former bath (No. 1).

It also smells more strongly of hydrogen sulphide, and it is not advisable to use it where the ventilation is poor. As its action ceases, more of B can be added.

The latter bath has also better lasting qualities. I have known it to tone without adding an additional quantity of B after it has stood over night.

AS A PRELIMINARY BATH.

Prints from some negatives when bleached and redeveloped with sulphide solution sometimes incline more to the yellow than is desirable. Having ascertained this fact, colder tones can be obtained on subsequent prints to be toned by using bath No. 1 as a preliminary bath. How long the print should remain in bath No. 1 cannot be stated with exactness, as there are several factors to be taken into consideration; chief among these are, 1, how much the color given by the bleach and redeveloping method differs from the desired color; 2, how fresh bath No. 1 is. The fresher the bath, the quicker it works. Other things being equal, the longer the print remains in bath No. 1 the colder the tone. In a freshly-prepared bath at the ordinary temperature, even fifteen seconds is enough to effect a change in color in the finished print.

As a general thing, any immersion, even one falling far short of the time necessary to produce a visible effect, is quickly made apparent by the print refusing to bleach as much as it would have done were it untreated, when placed in the bleaching solution.

Prints should be well washed before placing in bleaching solution, and should remain in it from 5 to 10 minutes or until it is certain that the bleaching is completed.

After bleaching, prints should be rinsed free from bleaching solution and redeveloped as recommended in the Velox redeveloper instruction.

What chemical reactions take place in what I would call the sulphide sulphocyanate method of toning I have not investigated far enough to state.

However, hydrogen sulphide is released, and this in its nascent condition no doubt has power enough to attack the silver of the image. It is also certain that other reactions have an effect, for if the ammonium sulphocyanate is replaced by an equal weight of the potassium salt, the toning action is *very* much slower.

To the question, Why does this method give a different color from that obtained by simple bleaching and redeveloping with sulphide solution? it might be answered, Because the conversion of the silver is not so complete as in the latter process. In reply would say that it would be hard to imagine the colors obtained on some prints as resulting from a combination of sepia and black.

As they are, the processes described are practical, but there is room for improvement.

To the photographic chemists the reactions involved will also prove worthy of investigation. Bearing on this subject three other experiments which were made are, without doubt, worth mentioning. A developed gaslight paper print partially immersed in a dilute solution of sodium sulphide, toned only on the parts which were exposed to the combined influence of the solution and the air. A print wet with water and used as a cover to a glass containing a sodium sulphide solution toned in the parts exposed to the fumes. When hydrogen peroxide was used to wet the print in place of water, quicker and better results were obtained. With the necessary fuming box this method might prove a commercial possibility.

To Dredge Nevada Placers.

Plans have just been perfected to dredge placers in Nevada on a colossal scale. The purpose is to operate placer mines at Osceola, Nevada. An immense pumping plant and gasoline hoist will be purchased; also two large dredges, capable of removing 2,500 yards of earth a day, are to be installed. Churn drills will also be employed to ascertain the extent of ground that is capable of being worked by dredges.

SCIENCE NOTES.

What is known as the poisonous bean of Java, which caused a number of serious accidents, was studied not long ago by M. Guignard. It appears that a poisonous grain has also been found in France by M. Bertrand, and this is the grain of vetch (*Vicia angustifolia*) which is used in the Medoc region for feeding cattle. This variety is different from the ordinary vetch (*Vicia sativa*) and gives a grain which shows an odor revealing the presence of hydrocyanic acid when ground up in water. To isolate the active body, which appears to be a glucoside known as *vicianine*, the grains are exhausted by cold alcohol. The extract is then treated by ether, which takes off the chlorophyls and the fatty matters. There remains a pasty mass which is taken up by alcohol and the latter deposits crystals of the vicianine. After re-crystallizing in water this body is seen in the form of brilliant colorless needle-like crystals which melt at 166 deg. C. The aqueous solution has a certain action upon polarized light. It appears that the grains of *Vicia angustifolia* which M. Bertrand observed can furnish about 0.75 part per thousand of hydrocyanic acid. Accordingly it is not safe to use it for feeding domestic animals.

In order to eliminate the disturbing effect of the severe vibrations set up by the London County Council's electric generating plant at Greenwich upon the adjustment of the transit telescope at the adjacent observatory, an ingenious modification of the device generally adopted for such purposes has been evolved. Earth tremors such as are set up by vehicular and railroad traffic are damped, as is well known, by means of a mercury trough with an amalgamated metal bottom. But the vibrations caused by the four engines installed in this station are of a much more serious nature, the image reflected in the mercury trough moving in such a manner as to show that the mercury is being subjected to forced oscillations, while the period agrees with the impulses due to the inertia of the reciprocating masses in the generating engines. Consequently, the ordinary means for damping these oscillations are abortive. The tremors formerly arising were more or less intermittent, whereas the present tremors are never wholly absent. Instead of using the saucer-shaped trough, a receptacle is adopted in which the mercury assumes the form of a thin film lying on an amalgamated metal surface, the curvature of which is so slight that the depth of mercury is less than 0.5 millimeter at the center of a circle 15 millimeters in diameter. By this means a perfectly steady surface is presented, in which the reflection is not disturbed by the heaviest vibrations set up when the four engines at the generating station are running simultaneously. The viscosity of the thin film is so great that even these long-period oscillations are completely damped out, and a satisfactory solution enabling observations to be effected by reflection in a mercury surface is assured. The film though still sufficiently fluid to assume the form of a horizontal plane participates in the motion of the ground like a rigid body, so that there is no relative displacement of the image with respect to the telescope. The committee of investigation, comprising the Earl of Rosse, the distinguished astronomer, the late Sir Benjamin Baker, and Mr. J. A. Ewing, appointed to inquire into the effect of this generating station upon the work of the observatory instruments, while satisfied with the efficiency of the above solution of a difficult problem, were not fully convinced as to whether the vibrations exercise any other injurious influences upon the utilization of the instruments, and suggested that a period of two years should elapse before a definite opinion is expressed, the question as to the extent of obstruction through the chimneys or discharge therefrom being similarly deferred. The committee, however, pointed out that the oscillations might have been reduced to the minimum, had the engines installed at the generating station been perfectly balanced, the type of plant adopted being eminently adapted to complete balance; but this precaution had not been adopted, and to rectify this error would be somewhat costly. When the outcry arose as to the work of the observatory being seriously affected, only one half of the designed generating plant had been installed, and the committee point out that the second section should comprise turbines, which with their attendant generators must be of the perfectly balanced type. The height of the chimneys is also restricted to the maximum of 204 feet above ordnance datum. The discharge of the gases from the chimneys is also to be carefully maintained, and must not materially exceed 250 deg. Fahr., while the capacity of the station is not to be extended beyond the contemplated 20,000 kilowatts of the second portion. In this way the committee hoped that the troubles which have arisen, while not entirely eliminated, may at all events be reduced to the minimum; and although they deprecated the fact that the site was ever selected for the generating station, they were of opinion that provided all precautions are observed, the work of the observatory will not be appreciably disturbed.