A New Process for Developing Photographs in Daylight.

If an ordinary dry plate, after it has been exposed in the camera, is placed in a bath of potassium iodide, the silver bromide is converted into the non-sensitive iodide, and the latter can then be developed in daylight with a suitable developer. It is recommended to carry out the process as follows:

The plate is laid for two minutes in an actinal solution (i. e., four per cent potassium iodide). This can be done in a suitable cloth bag. After this the development may be carried out in subdued daylight using equal parts of the solutions A and B.

A.

Water	600 grammes.
Anhydrous sodium sulphite	20 grammes.
Metol	1 gramme.
Hydroquinone	8 grammes.
Potassium bromide	40 grammes.

B. A three per cent caustic potash solution.

The plate should of course be rinsed before developing. The latter operation takes about five minutes. The fixing is carried out as usual, except that it takes a little longer. The exposure should be ample. The potassium iodide solution may be used over and over, but the developer should be mixed fresh for every plate.—Chemiker Zeitung.

Limitation of the Speed of Automobiles.

In England a recent municipal police ordinance requires high-power automobiles to carry apparatus which will give warning when the city speed limit is exceeded, or will automatically diminish the speed in such cases. An apparatus of the first class, which is much used, consists of an air-compressing cylinder prolonged at the bottom by a smaller cylinder containing a piston which has two peripheral vents and is forced forward by a spring.

The piston of the air-compressing cylinder is connected with the driving mechanism, and its velocity is proportional to the speed of the vehicle. So long as this speed is below the prescribed limit, the pressure of the air, which continually escapes through one of the vents of the small piston, remains too low to move this piston and compress the spring. When the legal speed limit is exceeded, however, the pressure rises, and the small piston is forced back until the second vent comes opposite a whistling vent in the wall of the small cylinder, so that the whistle is sounded by the escaping air.

An apparatus of the second class comprises an oil pump, the pipe of which is provided with a three-way cock. This cock is controlled by a centrifugal regulator, and its third channel communicates with a cylinder containing a piston which controls the accelerator, the brake, and the transmission. When the speed exceeds the normal limit, this third channel is opened by the action of the centrifugal regulator, and the oil is forced into the cylinder where, by its pressure on the piston which operates the brake, etc., it reduces the speed of the vehicle to the normal limit. This limit is indicated on a dial, and it can be varied by adjusting the spring of the centrifugal regulator by means of a key.

The Current Supplement.

In the industrial development which the last one hundred years has witnessed, it may well be claimed that the industry of iron and steel stands among the foremost. Mr. F. W. Harbord in an interesting article in the current Supplement, No. 1764, considers the various causes which have assisted in these vast developments; how on the one hand the engineer and chemist have made this progress possible, and how on the other hand the metallurgist, responding to the call of the varied modern requirements, has supplied the materials without which modern engineering developments would have been impossible. Dr. Alfred Gradenwitz tells how standard clocks are operated by wireless in the city of Vienna. The exhaustive review of recent improvements in the internal-combustion engine which has formed a feature of the last two numbers of the Supplement is concluded. Mr. Fred W. Lane shows how a practical telephone may be employed C. van Langendouck writes on the wonderful armored concrete viaduct of the Rotterdam and Scheveningen line. "The Seven Styles of Crystal Architecture" is the title of a paper which was read by Dr. A. E. H. Tutton before the Winnipeg meeting of the British Association for the Advancement of Science. That paper is published in the current Supplement. Emile Gadeceau contributes a popular article on marine plankton. Under the title "The Red God of the Sky," a popular article on Mars and theories of Martian habitability is presented.

Himly gunpowder contains 45 per cent chlorate of potash, 35 per cent of saltpeter, and 20 per cent of coal tar. In making it up, the tar is dissolved in benzine, the solution mixed with the salts and the benzine then evaporated.

SATURN AND HIS RINGS.

BY PROF. FREDERIC R. HONEY, TRINITY COLLEGE.

The study of Saturn and his rings is one of the most fascinating in astronomy. The enormous bulk of the planet (second only to Jupiter in diameter); its low density (less than that of any other planet); the great difference between the polar and equatorial diameter; and the rapidity of its axial rotation, alone make Saturn an object of peculiar interest. But the conspicuous features of the Saturnian system, viz., the vast

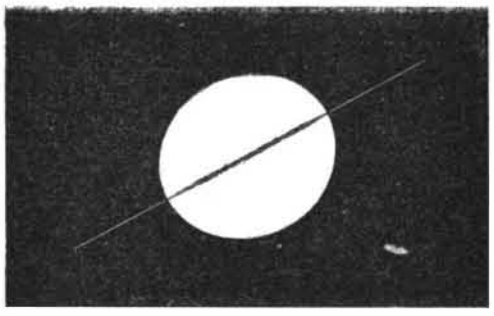

Fig. 1.—SATURN'S RINGS IN 1907.

rings and the brilliant retinue of ten satellites, which distinguish the planet from the other members of the solar system, constitute the problems of chief interest in the study mentioned.

Among the many advances in astronomical discovery is included a more accurate knowledge of Saturn's rings, the plane of which coincides with that of the planet's equator. It has been clearly proved that the theory of a rigid ring is untenable, and this view has long since yielded to the more scientific conclusion which maintains that the rings are in a mobile state, and that they are probably composed of swarms of

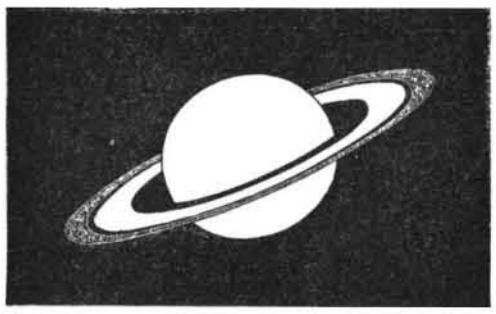

Fig. 2.—SATURN'S RINGS IN 1909.

meteors or satellites too small to be distinguished in the telescope. These bodies, obedient to the laws which govern the motions of satellites around their primary, would arrange themselves in the order as it now exists. The complexity of the problem is apparent. Since the thickness of the rings is not more than a hundred miles, and the diameter of the outer ring about one hundred and seventy thousand miles, the dimensions of these bodies must be very small, and their number extending over such a vast area well nigh incalculable. The installation at the present time of larger reflectors in our observatories augurs well for the value of observational work; and it is to be expected that in the future a more accurate knowledge of the constitution of the rings of Saturn will be obtained.

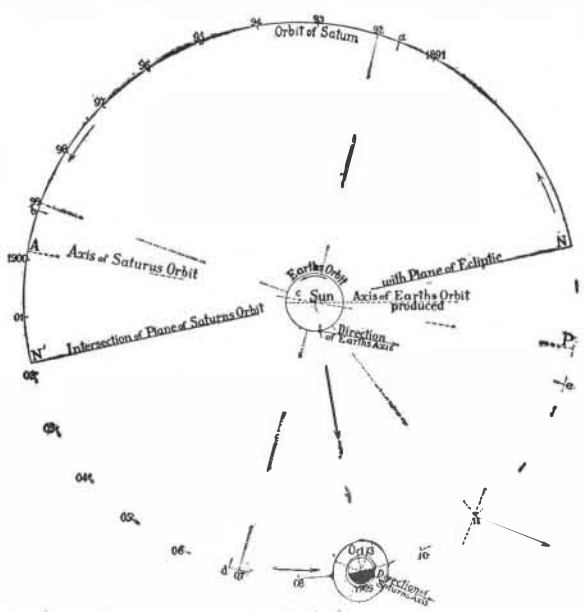

Fig. 3.—RELATIVE POSITIONS OF SATURN AND THE EARTH.

Saturn is now in that quarter of his orbit which includes perihelion. At an opposition which is near perihelion the planet approaches nearly one hundred million miles nearer the earth than at an aphelion opposition. As a consequence the apparent diameter of the planet and of the rings will increase at each opposition until perihelion is reached.

The plane of Saturn's orbit is inclined at an angle of nearly 2½ degrees to the plane of the ecliptic. In the diagram the full line represents that part of the orbit which is above the ecliptic; the dotted line the part below. The intersection of the plane of the orbit with that of the ecliptic is *N N'*, and these points are respectively the ascending and descending nodes. *A P* is the axis of the orbit whose center *c* is nearly fifty million miles from the sun. The revolution of the planet at a mean distance of 886 million miles from the sun is accomplished in nearly 29½ years; oppositions occurring at average intervals of 378 days. The positions of Saturn at successive oppositions are shown from 1891 to 1911. The plane of the rings is inclined at an angle of 28 degrees to that of the ecliptic, and the plane traverses the earth's orbit twice during each revolution in opposite directions in a little less than a year (= 360 days). When it passes through the sun it is pierced by the planet's orbit at *a* and *d*, the positions of Saturn at opposite points in the orbit, which are reached at intervals of about fifteen years. When the planet is at either of these positions an edge view of the rings is presented to the sun. The extreme points of contact of the plane of the rings with the orbit are *b* and *e*; and when Saturn is at either of these positions the rings are seen to the best advantage, i. e., they open to their greatest apparent width. The minor axis of the ellipse representing each ring is nearly one-half the length of the major axis.

At the date of the opposition of 1899 the planet was near *b*, and a satisfactory view of the northern hemisphere of Saturn and of the upper surfaces of the rings was obtained. At the opposition near *e* the southern hemisphere and the under or southern surfaces of the rings will be visible. Also the planet will be nearer the earth, and the apparent dimensions increased about one-eighth. Saturn will be in the northern heavens and therefore seen to good advantage in high latitudes. The plane of the rings traversed the earth's orbit in 1891-2. Fifteen years later, in 1907, this plane again crossed the earth's orbit, and an edge view was obtained. Fig. 1 shows Saturn and his rings in this position, making apparent the difference between the polar and equatorial diameters. The thickness of the rings is estimated between fifty and one hundred miles. But this measurement is so small in comparison with the diameter of the ring that it is impossible to represent it in correct proportion by the scale of the figure. The fine white line may therefore be accepted as a representation of the rings for a short period of time just before and after the edge view was presented, when they entirely disappeared, and the planet alone remained visible. The positions of Saturn and the earth are shown at the date of opposition in 1909. It is scarcely necessary to say that while the planets are correctly proportioned in the plot, their dimensions are enormously exaggerated in order to compare their magnitudes. If they were drawn to the scale of the orbits they would shrink to mere points. Saturn's axis moves parallel to itself. To an observer on Saturn (if life were possible on the planet) the heavens would appear to move in the same general direction as they appear to us, but around another pole, and in less than half the time, as Saturn's rotation on his axis is accomplished in about ten hours and a quarter.

Two years have passed since the edge view was presented to the earth. The rings are gradually widening, and their under surface becoming visible. Fig. 2 shows saturn and his rings as seen in a telescope at the date of opposition this year. As the telescope gives an inverted image, in order to obtain a correct view Fig. 2 should be inverted. The larger area of the planet in the drawing represents the southern hemisphere which is turned toward the earth. The figure shows the division between the outer and inner rings, and between the "crape" ring and the planet. At each successive opposition the rings will widen and the markings on their southern surfaces will be more easily distinguished.

The present time offers an excellent opportunity for a telescopic study of Saturn and Mars. Both planets are evening stars, and both are near opposition. They are slowly approaching each other and will be in conjunction on December 31st.

Various salts added in small quantities to the water used in mixing Portland cement appreciably accelerate or retard the setting of the mixture. The setting is retarded by water containing 4 per cent or more of sodium chloride, and by weak solutions of calcium chloride, but the latter salt in concentration higher than 9 per cent acts as an accelerator. Aluminium chloride accelerates, while iron chloride, most soluble sulphates, and even plaster of Paris retard setting. Aluminium sulphate is an accelerator, and in the compound alums its effect preponderates over that of the retarding alkaline sulphates and produces a slight acceleration. The alkaline carbonates accelerate in weak solutions, but soda acts as a retarder when its concentration exceeds 10 per cent. Borax, boric acid, phosphates, chromates, and chromic acid in any concentration retard the setting.