

to photographic recording. A spot of light from a slit or hole is allowed to fall on to the mirror of a mirror-galvanometer, whence it is reflected on to a sensitised plate. This method is frequently used nowadays in investigating the critical points of steel. The writer mentions the recording apparatus thought out by M. Saladin, which permits of tracing all kinds of curves on a photographic plate by using two mirrors both capable of rotation about a vertical axis and operated by two galvanometers. A fixed mirror, inclined 45° to the horizontal, is placed between the two moving mirrors. The ray of light reflected by the first mirror is thus given a horizontal movement, which becomes vertical after reflection by the fixed mirror at 45° . It is then reflected on to the second mirror, which imparts to it a second and final horizontal displacement. Finally, the combination of these two perpendicular movements traces a curve on a stationary photographic plate. It is thus possible to plot directly curves of electric resistance, of dilatation, and of E.M.F. in terms of temperature.

IN view of the importance of internal waterways and of the many questions which revolve round the development of the hydraulic resources of their country, the National Association of Navigation Congresses in Italy has inaugurated the publication of a small periodical of eight pages, known as *Navigazione Interna*, to deal with matters of interest in that connection as they arise. The first issue, for May, 1917, lies before us and contains an account of the work of the Hydro-technical Institute at Stra, associated with the University of Padua and the Hydrographic Department at Venice, describing in particular the experimental tank 200 metres (656 ft.) long, with a bottom width of 3.70 metres (12 ft.), a top width of 10.75 metres (35½ ft.), and a mean depth of 3.50 metres (11½ ft.). The tank is constructed in cement concrete, with light metal reinforcement, and is fitted with a moving platform and the appropriate mechanical equipment. The institute undertakes experimental work in connection with all hydraulic problems, including those in regard to the resistance offered to the movement of solid bodies in water. Another interesting article in the journal deals with a Swiss project of a navigational connection between Lake Maggiore and the River Po. We welcome the advent of this latest recruit to the service of hydrological science.

EVIDENCE of the difficulty of destroying reinforced-concrete buildings is given in an article on concrete in war in the *Times Engineering Supplement* for July 27. Steel cupolas have been blown to fragments by high-explosive shells, while similar structures in reinforced concrete have survived the ordeal with comparatively little injury. Many of the reinforced concrete buildings plentifully scattered over Northern France have been used by the Germans as well as by ourselves, and have shown remarkable capacity for withstanding artillery fire. One case quoted is of an elevated reservoir measuring about 80 ft. long, 40 ft. wide, and 12 ft. deep, supported on a framework of thin columns more than 40 ft. high, with horizontal bracings. The flat roof at a height of 55 ft. was used by the Germans as a ready-made observation post. This reservoir, built in June, 1911, of Hennebique ferro-concrete, was destroyed so far as possible when the Germans evacuated the town in March last, having successfully withstood our bombardment, which destroyed all surrounding buildings. The columns were broken by explosives, allowing the reservoir proper to fall to the ground, where it remained intact save for a few cracks and holes cut in the corners, where explosives had been inserted with the object of trying to damage the walls.

NO. 2493, VOL. 99]

OUR ASTRONOMICAL COLUMN.

DISCOVERY OF A NEW STAR.—According to the *Times* of August 6, the discovery of a new star by Mr. Ritchey on July 19 has been announced by Prof. Pickering. The star is very faint, being of the 14th magnitude, but it may be of special interest because of its situation in the nebula N.G.C. 6946. This is a large faint nebula in Cygnus, its position being R.A. 20h. 33m. 17s., decl. $+59^\circ 51'$.

STELLAR MOTIONS AND ABSOLUTE MAGNITUDES.—The relationship of stellar motions to absolute magnitudes has been further investigated, as regards 1300 stars of types F, G, K, and M, by W. S. Adams and G. Strömberg (*Astrophysical Journal*, vol. xlv., p. 293). Parallaxes determined by the spectroscopic method were available for about 700 of the stars used, and these were supplemented by others derived with the aid of a new formula connecting mean parallax with proper motion. From the parallaxes and apparent magnitudes, the absolute magnitudes are easily calculated, being defined as apparent magnitudes reduced to the distance corresponding to a parallax of $0.1''$. The stars being divided into groups defined by certain limits of parallax, it is first shown that among stars at the same distance from the sun there is an increase of radial velocity with decrease in absolute brightness, and that there is little evidence of any variation in radial velocity depending upon distance from the sun. For the spectral types considered, the increase in velocity is 1.5 km. for a decrease in brightness of one magnitude. It is shown that this effect cannot be ascribed either to distance from the sun, to the law of frequency-distribution of the velocities, or to the effect of stream motion. The same conclusion is reached with regard to the cross linear motions of the stars, and it appears to hold in the mean for apparent as well as for absolute brightness. The stars of types K and M have mean velocities about 1.0 to 1.5 km. higher than the F and G stars of the same absolute magnitude.

UNION OBSERVATORY, JOHANNESBURG.—Circular No. 37 of the Union Observatory includes measures of ninety-eight double stars and the results recently obtained by the blink microscope in connection with proper motions and new variable stars. On twenty-three pairs of plates taken at the Melbourne Observatory, at intervals averaging about twenty years, 104 proper motions were found and measured, twenty-three of the stars having a centennial proper motion of $20''$ or more; fifty-six of these stars have a motion nearly parallel to the galactic plane and towards the solar ant-apex. Proper motions amounting to only $0.04''$ or $0.06''$ a year were easily and certainly determined. A disagreement with the results from astrographic measurements in the case of three pairs of plates taken at the Cape Observatory has led to an interesting correspondence with Prof. Kapteyn. The general impression obtained by Mr. Innes from his work with the blink microscope is that practically all stars, nebulae, and clusters in any one region are at the same distance from us, and that with very few exceptions they are all relatively fixed. In Circular No. 38 Mr. Innes announces an important undertaking in the form of a photographic map of the southern sky, from the Franklin-Adams star plates. Each chart will be ruled with hour circles and parallels, and will cover a little more than 30 square degrees, the scale being 36 mm. to 1° . The region to be covered will require 556 charts. An excellent specimen chart accompanies the circular, and others will be issued as opportunity offers.