Thus, if the plan be required on a scale of 1/20,000, the model is assumed to have been reduced to that scale, and the problem consists in making a plan full size by means of angles and photographs obtained on the model.

No change being made to the camera, the focal length preserves the same value; if one foot, it covers on the model a distance corresponding to 20,000 ft. on the ground. A distance of a mile contains 5,280 ft. on the ground, and is represented on the model by 5,280 "scale feet."

The focal length of one foot mentioned above would be a focal length of 20,000 "scale feet." It follows that, although the problem consists in representing a model full size, the scale may be employed to measure the actual dimensions, the value of one division being considered as an arbitrary unit.

In plotting, the primary triangulation is assumed to have been previously calculated; the primary stations can therefore be plotted at once by their co-ordinates. For example, the camera station has been observed from one or more triangulation points. A camera station, M, having been observed from a triangulation point A, triangles may be formed with M, A, and other triangulation points observed both from A and M, such as B. In the triangle MAB, the angles at M and A have been observed, and $B = 180^\circ - (A + M)$. Similar calculations made for other triangulation points give the directions of the station as seen from these points; the plotting is done as if the station had been observed from every such point.

From the foregoing it is evident that the surveyor should endeavor to obtain at least one direction from a triangulation point on every camera station; the plotting is less laborious and the result more accurate.

Contour Lines.—A sufficient number of heights having been determined, the contour lines are drawn by estimation between the points established. In a rolling country a limited number of points is sufficient to draw the contour lines with precision, but in a rocky country the reflections on the surface are so abrupt and frequent that it is utterly impossible to plot enough points to represent the surface accurately. Every point, however, plotted has been marked on the photograph, and the altitudes may be taken from the plan.

Precision of the Method of Photographic Surveying.—The precision of a survey executed by the methods exposed, when all the points are established by intersections, is the same as that of a plan plotted with a very good protractor or made with the plane table. There is, however, this difference: the number of points plotted by photography is greater than by the other methods.

Points plotted by means of their altitude below the station are far less accurate, their positions being given by the intersection of the visual ray with the ground plane, the angle of intersection being equal to the angle with the horizon plane or to the angle of depression of the point. With the camera employed, embracing 60°, this angle is always less than 30°; even that is seldom obtained in practice, a declivity of 30° being almost a precipice. Therefore, the intersection is always a poor one and the uncertainty becomes considerable with points near the horizon.

With perspective instruments, doing mechanically the same construction, the results are still less precise, being affected by the instrumental errors.

On the other hand, it must not be forgotten that when these methods are employed, the ordinary topographer would fall back on sketching; the results furnished by topography are therefore indefinitely more precise.

UNITED STATES PRODUCTION OF EXPLOSIVES.

As explosives are essential to mining, and the use of improved types of explosives lessens the dangers of mining, the U.S. Bureau of Mines undertook the compilation of information showing the total amount of explosives manufactured and used in that country, its first report dealing with the year 1912. It now issues the second technical paper relating solely to the production of explosives. It is expected that similar publications will be compiled annually, and that with the co-operation of the manufacturers these statements will be published within a few weeks after the end of each year.

The figures show that in 1902 only 11,300 pounds of permissible explosives was used in coal mining, whereas in 1913 the quantity so used was 21,804,285 pounds. The quantity of permissible explosives used in the United States is larger than in a number of other countries. In 1912 it represented about five per cent. of the total quantity of explosives produced, and in 1913 six per cent. The total amount of explosives used for the production of coal in 1913 was 209,352,938 pounds, of which about ten per cent. was of the permissible class as compared with eight per cent. in 1912. The use of permissible explosives in coal mining has had gratifying results, and few, if any, serious accidents can be attributed directly to their use.

The total production of explosives, according to the figures received from manufacturers, was 463,514,881 pounds in 1913, as compared with 489,393,131 pounds for 1912. This production is segregated as follows: Black powder, 194,146,747 pounds; "high" explosives other than permissible explosives, 241,682,364 pounds; and permissible explosives, 27,685,770 pounds. These figures represent a decrease of 36,146,622 pounds of black powder and an increase of 7,212,872 pounds of high explosives and 3,055,500 pounds of permissible explosives.

NOVEL POWER DEVELOPMENT SCHEME.

A method of producing power from sea water by the rise and fall of the tides is proposed. Portions of the coast where high tides are the rule are chosen and a number of clefts in the cliffs are constructed or those of nature especially adapted. The water runs far into the openings at high tide and by means of pipes is trapped into a huge reservoir. Where the tide falls hundreds of gallons of water are thus left behind. Being on a high level it is then a comparatively simple matter to drop this water by means of pipes to a level many feet below and utilize the power thus obtained by the usual water jets acting on specially constructed wheels.

The latest statistics regarding the development of wireless telegraphy in the German Empire are up to the beginning of 1913. At the beginning of that year there were 23 coast stations and 376 ship stations. Of the coast stations, 12 were open to general traffic, 10 with limitations, and 1 for official use. Of the ship stations, 237 were for public, 134 for official, and 5 for private traffic. The number of wireless telegrams sent from the shore to the ships in 1912 was only 5,312; in the contrary direction, 14,893. Between ships 7,242 telegrams were exchanged. This makes a total traffic in telegrams of 27,447. Receipts for the year totalled 250,000 marks. In these figures the German Protectorates are included.