permanently inhabited village in Switzerland is Juf (6998 ft.), at the head of the Avers valley (a tributary of the Hinter Rhine, Grisons), while the lowest is Ascona (666 ft.), on the Lago Maggiore and just south-west of Locarno.

According to the most recent calculations, the total area of Switzerland is 15,951 sq. m. (some 25∞ sq. m. less than that of Scrvia). Of this 11,927∙5 sq. m. (or 74∙8%) are reckoned as “ productive,” forests occupying 3,390·9 sq. m. and vine- yards 1o8∙7 sq. m., the remainder, or 8427∙7 sq. m., consisting of arable and pasture land. Of the “ unproductive ” area of 4023∙5 sq. m (or 25∙2%) much consists of lakes and rivers, while glaciers cover 7o9∙7 sq. m. Approximately the Alps occupy one-sixtieth of this area, the Jura about one-tenth, and the “ plateau ” the rest. Of the entire area the great cantons of the Grisons, Bern and the Valais take up 7411·8 sq. m., or nearly one- half, while if to them be added Vaud, Ticino and St Gall the extent of these six (out of twenty-two) cantons is 10,527∙6 sq. m., or almost two-thirds of the area of the Confederation. Not included in the total area of Switzerland are three small “ enclaves ” (4 sq. m. in all), Büsingen and Verenahof (both in Schaffhausen) belonging to Baden, while Campione (opposite Lugano) is Italian. Switzerland borders on many countries— France west and south-west, Italy south, Austria east (Tirol and Vorarlberg), and Germany north (Bavaria, Württemberg, Baden and Alsace). Switzerland sends its waters to four great river basins (which drain to three different seas) in the following proportions: Rhine basin, 11,159 sq. m.; Rhone basin, 2768 sq. m.; Po basin, 1361 sq. m.; and Inn basin, 663 sq. m.

The thirteen cantons which till 1798 formed the Confederation are all comprised in the Rhine basin, the ten oldest *(i.e.* all before 1500) being within that of the Aar, and it was only after 1798 that certain Romonsch-, French- and Italian-speaking “ allies ” and subject lands—with their river basms—were tacked on to them.

Most of the great Swiss rivers, being in their origin mere mountain torrents, tend to overflow their banks, and hence much is required and has been done to prevent this by embanking them, and regaining arable land from them. So the Rhine (between Ragatz and the Lake of Constance), the Rhone, the Aar, the Reuss; and in particular we may mention the great work on the Linth (1807-1816) carried out by Hans Konrad Escher, who earned by his success the surname of "Von der Linth,” and on the Zihl near the lakes of Neuchâtel and Bienne, white the diversion of the Kander from its junction with the Aar at Thierachern to a channel by which it flows into the Lake of Thun was effected as early as 1714.

There are very many *lakes,* large and small, in Switzerland. The two most extensive, those of Geneva and of Constance, balance each other, as it were, at the south-west and north-east corners of the land. But neither of these is wholly Swiss, this distinction being claimed by the next in size, that of Neuchâtel (92∙4 sq. m.), the Lago Maggiore (partly Swiss only) coming next in the list, and being followed by the wholly Swiss lakes of Lucerne and of Zürich. Then come Lugano, Thun, Bienne, Zug, Brienz, Morat, the Walensee, and Sempach (51/2 sq. m.). These fourteen only are over 4 sq. m. in extent. Eleven of them are in the Rhine basin (also in that of the Aar), two (Maggiore and Lugano) in that of the Po, and one (Geneva) in that of the Rhone. There are no large lakes in the Swiss portion of the Inn basin, the most extensive being that of Sils (11/2 sq. m.). Of the smaller lakes those best known to travellers are the Daubensee (near the summit of the Gemmi), the Oeschincnsee (at the foot of the Blümlis Alp range) and the Märjelensee, formed by the damming up of the waters of the Great Aletsch glacier by a huge lateral moraine. Alpine tarns are innumerable.

Of the countless *waterfalls* in Switzerland those of the Rhine (near Schaffhausen) have volume but not height, while the reverse is the case in varying degrees with those of the Aar at the Handegg, of the Reichenbach, of Pissevache, and particularly of the Staubbach, a mere thread of water falling clear of a cliff of great height.

There are said to be 1077 *glaciers* in Switzerland, but it is really impossible to estimate the number accurately, as practically all are now in retreat, and it is not easy to say whether an isolated fragment of ice is or is not entitled to rank as an independent glacier. From them flow all the more important Swiss rivers and streams. Yet their distribution is very unequal, for eleven cantons (just one-half of the Confederation) have none. The Valais heads the list with 375 sq. m., then come the Grisons (138∙6), Bern (111∙3), Uri (44·3), Glarus (13∙9) and Ticino (13·1). The five others (Unter­walden, Vaud, St Gall, Schwyz and Appenzell) boast of 13∙3 all together. The three longest glaciers in the Alps are all in the great northern outlier (not in the main chain)—the Great Aletsch (161/2 m.), the Fíescher and the Unteraar (each 10 m.). In the main chain the Gorner (91/4 m.) is the longest. Of glaciers covering an area of over 6 sq. m. no fewer than 17 are in Switzerland, as against two each in the French portion of the chain of Mont Blanc and in the Eastern Alps.

*Forests* cover 21∙2% (339o∙99 sq. m.) of the total area of Switzerland. Of the six most extensive cantons five are also at the head in the matter of forests: Bern (591.sq. m.), the Grisons (503), Vaud (320), the Valais (297∙4) and Ticino (267∙2). St Gall (157) ranks in this respect after Zürich (18o∙8) and Aargau (172), while the only other cantons with over 100 sq. m. are Lucerne (12o∙4), Fribourg (119) and Soleure (111∙3), the lowest place being taken by Geneva (9∙9). By far the greater part (67%) of the forest area belongs to the communes or private corporations, while 28·5% is in the hands of private individuals (much of this having become private property in the time of Napoleon I.), but only 4·5% is in the hands of the state, in consequence of the suppression of many monasteries. The communes own 94∙3% of the forest area in the Valais, private individuals 78∙8 % in Lucerne, and the state 16% in Schaffhausen. Schaffhausen and the Jura cantons are the most wooded in proportion to their area, while at the other end of the scale are the towns of Geneva and Basel, and the barren canton of Uri. The great floods of. 1834, 1852 and 1868 drew attention to the negligent administration of the forests, considered specially as a protection against damage due to the forces of nature. A forestry department was created in the polytechnic school in Zürich when it was opened in 1855. The Federal Constitution of 1874 (art. 24) handed over to the Confederation the oversight of the forests “ in the high mountains,” this being interpreted to mean the Alps with their spurs, but not to include the Jura, and a Iaw of 1876 was enacted to carry out this task. In 1897 the limitation mentioned above was struck out, so that the Confederation now has oversight of *all* forests within its territory, a law of 1902 regulating in detail thé whole subject. Since 1876 much has been done, either directly by the Confederation or indirectly by subsidizing the efforts of the cantons, to reafforest districts where the trees had been recklessly cut down, and to ensure the proper administration of forests generally.

*Geology.—*The greater part of Switzerland is occupied by the belts of folded rock which constitute the Alps and the Jura *(q.v.).* The central plain, however, is covered by nearly undisturbed deposits of Ohgocene and Miocene age, concealed in many places by glacial, alluvial and other accumulations of later date. Both the Oligocene and the Miocene beds are, for the most part, of fresh- water or brackish-water origin, but the middle of the Miocene series is formed of marine deposits. During this period an arm of the Mediterranean spread up the valley of the Rhone. It reached its maximum extension during the middle portion of the Miocene period, when it appears to have stretched continuously along the outer border of the Alps from the present Golfe du Lion into Austria; but at an earlier and a later date it was represented in Switzerland only by a series of brackish-water lagoons or fresh-water lakes.

Climate.—In Switzerland, where the height above sea-level ranges from 581 ft. (Lago Maggiore) to 15,217 ft. (Monte Rosa), we naturally find very many climates, from the regions of olives, vines, oaks and beeches, pines and firs, to those of the high mountain pastures, rhododendrons, and of eternal snow. It has been reckoned that, while in Italian Switzerland winter lasts only three months, at Glarus (1578 ft.) it lasts four, in the Engadine (5945 to 3406 ft.) six, on the St Gotthard (6936 ft.) eight, on the Great St Bernard (8111 ft.) nine, and on the St Théodule Pass (10,899 ft.) practically always. The highest mean annual temperature (530 F.) in Switzerland is naturally that at Lugano (909 ft.), while at Bevers (5610 ft., Upper Engadine) the lowest mean temperature in winter is -14° F., but the highest in summer is 77ο F., an immense difference. At Montreux the annual mean is 50°, at Sion, Basel, Geneva and Coire about 49°, at Zürich 48°, at Bern and Lucerne 47∙5°, at St Gall 45°, at Davos 37∙5°, at Sils-Maria 34∙5°, and on the Great St Bernard 29°. Of course many factors, such as the shape of the ground, the sheltered position of the place, the degree of exposure to sunshine, counterbalance the mere height at which the town is situated.

The snow-clad AIps of course have the heaviest rain- or snow-fall in Switzerland, this being estimated at 89∙7 in. per annum. The greatest actually recorded rainfall (87·3 in.) was on the San Bernar­dino Pass (6769 ft.), while the lowest (21 ∙7 in.) was at Sierre (1767 ft., Valais). At Lugano the average annual rainfall is 65∙4 in., on the Great St Bernard 48∙7 in., at Lucerne 45∙6 in., at Montreux 42∙6 in., at Sils-Maria 37 in., at Bern and Davos 36∙6 in., and at Basel Coire and Geneva about 32∙7 in. It has been shown by careful observa- tions that the rain- or snow-fall is greatest as we approach the Alps, whether from the north or the south, the flanks of the great ranges and the valleys opening out towards the plains receiving much more rain than the high Alpine valleys enclosed on all sides by lofty ridges. Thunderstorms generally vary in frequency with the amount of rainfall, being most common near the great ranges, and often very local· The floods caused by excessive rainfall are sometimes very destructive, as in 1834, 1852 and 1868, while the same cause leads to landslips, of which the most remarkable have been those of the Rossberg above Goldau (1806), at Evionnaz (1835) and at Elm (1881). The Föhn *(q.υ.)* is the most remarkable local wind.

For all these reasons Switzerland has many varieties of climate; and, while, owing to the distribution of the rainfall, the Ticino and