The health-resort of Tarasp-Schuls, Engadine, (Switzerland) : its remedies and indications, briefly described for the guidance of physicians / by J. Pernisch.

THE HEALTH-RESOR

OF

TARASP-SCHU

ENGADINE (SWITZERLAND).

ITS REMEDIES AND INDICA

NOTES DESIGNED FOR THE GUIDANCE OF PHYSI

BY

J. PERNISCH, M.D.

LATE PHYSICIAN AT TARASP-SCHUL

SECOND EDITION.

WITH NINE ILLUSTRATIONS AND A DI

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1. Description of the Health-Resort of Tarasp-Schuls.

In the heart of the Rhætian Alps, near the extensive glaciers of the majestic Bernina group—the idyllic cradle of the infant Inn, which, lower down, near Passau, pours its clear waters into the Danube—begins the beautiful and renowned Alpine valley of the *Engadine*. From here it extends in a curve nearly sixty miles in length through the south-eastern corner of Switzerland, being bounded on either side by mighty ranges of snow-clad mountains, which separate it from the network of fertile valleys composing the remaining portion of the canton of Grisons in the north, and from the luxuriant fields and vineyards of Italy in the south. The River Inn, after flowing gently through the placid lakes of the *Upper Engadine*, and intersecting like a thread of silver the verdant grassy meads and pasture-lands of that lofty valley, enters the *Lower Engadine* through the narrow channel which the rushing waters have carved for themselves in the rocks. On either side the river is hemmed in by stupendous mountains, alternately approaching and receding from each other, thus forming a regular succession of narrow defiles and open valleys. As far as Ardetz the river continues its boisterous and impetuous course through the deep rocky fissure, then it suddenly checks its speed, as if to enjoy the prospect of the lovely district it has reached. Further and further do the mountains recede from the river, until they encircle with their protecting ramparts the beautiful

and sunny dale in which lies the *health-resort of Tarasp-Schuls,* combining the finest scenery of the Lower Engadine with a delicious Alpine climate, and with a number of medicinal springs possessing various properties, and occurring in remarkable proximity to one another.

The *health-resort of Tarasp-Schuls* occupies one of the middle terraces of the Lower Engadine, (which descends gradually in a series of rocky ledges from south-west to north-east), and is situated in latitude 10° 15' east of Greenwich, and in about 46° 47' northern longitude. The district is divided into two nearly equal sections by the River Inn, which here flows in a serpentine course. The left or northern half forms a somewhat uneven plateau, while the right or southern side of the valley rises in two unequal, steeply-sloping terraces. From a suitable and sufficiently elevated standpoint on the northern, less rugged acclivity, we are afforded a remarkably fine prospect of the health-resort, its different charmingly-situated and variously-grouped villages, and the numerous mountains forming a vast semicircle around it.

Exactly opposite us, in the south, there rises an immense but symmetrically-divided mountain-chain, composed of rugged and fantastically-shaped limestone peaks, descending to the valley in precipices of fearful abruptness. These naked and barren crags are of a greyish-red colour, and are far too steep to afford a lodgment for snow; though here and there, in deep rifts and shady fissures, narrow bands of snow and small hanging glaciers serve as an indication of the great height of these mountains, most of which attain an altitude of between nine and ten thousand feet, so that on an average they tower full six thousand feet above the valley. Magnificent dolomite cliffs, extraordinarily manifold in form, extend from *Piz Lat,* bounding the Malser Haide, to *Piz Ivraina,* where they are joined in the south-west by the majestic pyramids of the granite mountains, whose softer outlines contrast strikingly with the bold limestone peaks. Especially conspicuous and well-defined in the midst of this chain is an imposing group of three lofty

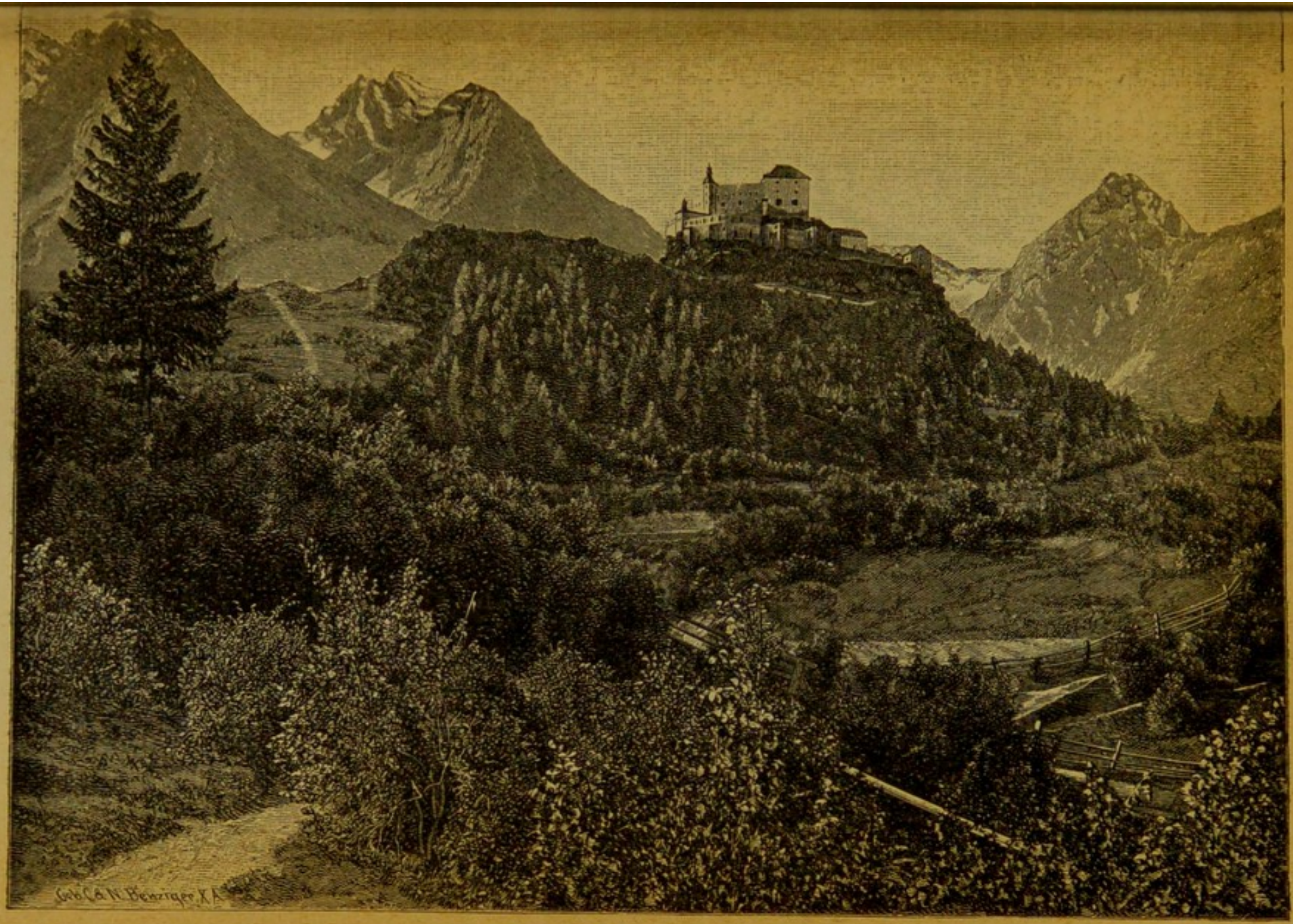
summits, rising skyward in peerless majesty, and dominating the entire beautiful landscape, including the health-resort which nestles so picturesquely at their base. In the east the stupendous *Piz Lischanna* (10,180 feet) rears proudly aloft its steep and finely-shaped head, turned towards the north, and supported on either side by broad, shoulder-like bands of rock. In the saddle-shaped depression between it and its slender pyramidal neighbour, *Piz St. Ion* (9977 feet), there glitters, in robes of snowy whiteness, a bow-shaped fragment of the Lischanna Glacier, which occupies a considerable portion of the southern declivity of this mountain, on the side furthest from our valley. Piz St. Ion is bounded on the west by a dark, narrow, and deeply-cut fissure, the gorge-like outlet of the extensive grassy valley of the *Scarl,* from which descends the wild and foaming *Clemgia,* forcing its way through the rocks. Beyond the ravine of the Clemgia, rises the colossal *Piz Pisog* (10,426 feet), a mountain almost unrivalled among the Alps both in grandeur of form and vastness of extent; towards the Scarl-Thal and the main valley it presents the aspect of a high, naked, and precipitous rocky wall, at the base of which, testifying to the slow but constant work of destruction which is going on, immense heaps of débris have collected. The crest of the mountain is formed by a long ridge, which from our standpoint, however, appears as a slender pyramid crowned with eternal snow. From the upper part of its little western lateral valley, Val Zuort, the glistening snow of a long and narrow glacier attracts our notice.

In front of this imposing background there spring from the three last-named mountains a couple of terraces separated by the tumultuous Clemgia, and which, projecting into the valley, form a magnificent foreground, covered as they are partly with meadows and fields, partly with dense forests. Opposite us upon one of them spreads the beautiful plateau of *Tarasp.* Perched on the summit of a steep isolated rock is the ancient and venerable castle of the same name (see illustration p. 7), its walls and battlements showing distinct

traces of the ravages of time; at its feet glitter the azure waters of a tiny lake. Not far off is the church, and adjoining it the Capuchin convent of *Fontana,* behind which the grey wooden roofs of a numerous group of houses are visible. Beyond these there opens towards the south-west the narrow valley of Plafna, bounded by lofty and precipitous cliffs, and swept by a wildly foaming torrent. The surface of the undulating plateau is dotted with hamlets and farm-houses, between which we catch glimpses of low, bush-covered hills, waving corn-fields, flowery meadows, and tracts of woodland. The lower portion of this plateau forms a magnificent expanse of level pasture-land, almost surrounded by sheltering woods, and occupied by stately buildings. This is the hamlet of *Vulpera,* consisting for the most part of hotels and boarding-houses.

Below the steep wooded escarpment in which the plateau of Vulpera suddenly ends, the clear and rapid Inn pursues its course through the midst of the valley. On the right bank of the river rises the *Trinkhalle* or Spa Building, ornamented in the middle by a large rotunda, and occupying a site obtained partly by cutting away the rocks, partly by constructing costly embankments. On the left bank, at a somewhat greater distance from the river, we see the roof of the extensive and handsome *"Kurhaus Tarasp",* not far from which, but rather higher up on the northern slope, rises the massive steeple of the newly-erected English church.

Turning our glance further eastward there unrolls before us the cheerful landscape of a bright and gently-sloping plateau, upon which stands the stately village of *Schuls,* consisting of several long rows of houses surrounded by fertile corn-fields and meadows carpeted with richest verdure. Chiefly conspicuous are the handsome modern hotel buildings, while the trim church looks serenely down from a rocky eminence near the silver-flowing river. Along the entire north side of the valley, above the waving corn-fields, the moderately steep slopes are occupied almost uninterruptedly by magnificent pastures, and the rounded summits in which these slopes terminate form a striking con-



TARASP CASTLE.

trast to the wild and rugged cliffs in the south. At some distance behind them—invisible, of course, from our standpoint—rise the mountain-ridges of *Piz Minschun* (10,075 feet) and *Piz Champatsch* (9622 feet), ending at length in *Piz Fatschalv* (10,429 feet) and the ice-clad *Fluchthorn* (11,141 feet), gigantic peaks belonging to the very extensive Silvretta group, famous for its glaciers; so that on this side also, towards the north, the valley is sheltered in a most effectual manner.

In the west is the plateau of *Ardetz,* about 850 feet higher, descending to the valley in steep rocky ledges, and forming a barrier broken only by the deep and narrow ravine of the Inn. To the east of the above-mentioned Piz Lat is the low, saddle-shaped *Norbertshöhe* (4816 feet), closing the valley in this direction. Across these heights a good carriage-road leads in numerous zigzags from Nauders in the Tyrol to the Swiss frontier station of Martinsbruck.

But where then, it will be asked, is the *Health-Resort of Tarasp-Schuls* itself? Tarasp is nothing more than a collective name for the above mentioned villages and hamlets, which are scattered over the terraces at the base of the lofty Piz Pisog and its spurs, and form one political commune. It is true that the village adjoining the castle of Tarasp and fringing the lake is often designated *Dorf Tarasp;* its correct name, however, is *Fontana.* But since several of the springs (the Lucius, Emerita, Carola, and Bonifacius-Quellen) rise on the right bank of the Inn and in the territory of the "political commune of Tarasp", and others, the Ursus and Neue Bade-Quellen, are found opposite the first-named ones, on the left bank of the river, in the territory of the commune of Schuls, while the Wy and the Sotsass-Quellen are situated in the immediate vicinity of Schuls itself, the health-resort as a whole has rightly obtained the collective appellation of *Tarasp-Schuls.* For the same reason the joint-stock company which has taken on lease for a term of 70 years all the springs in both these communes, bears the name of the "Tarasp-Schuls Company"

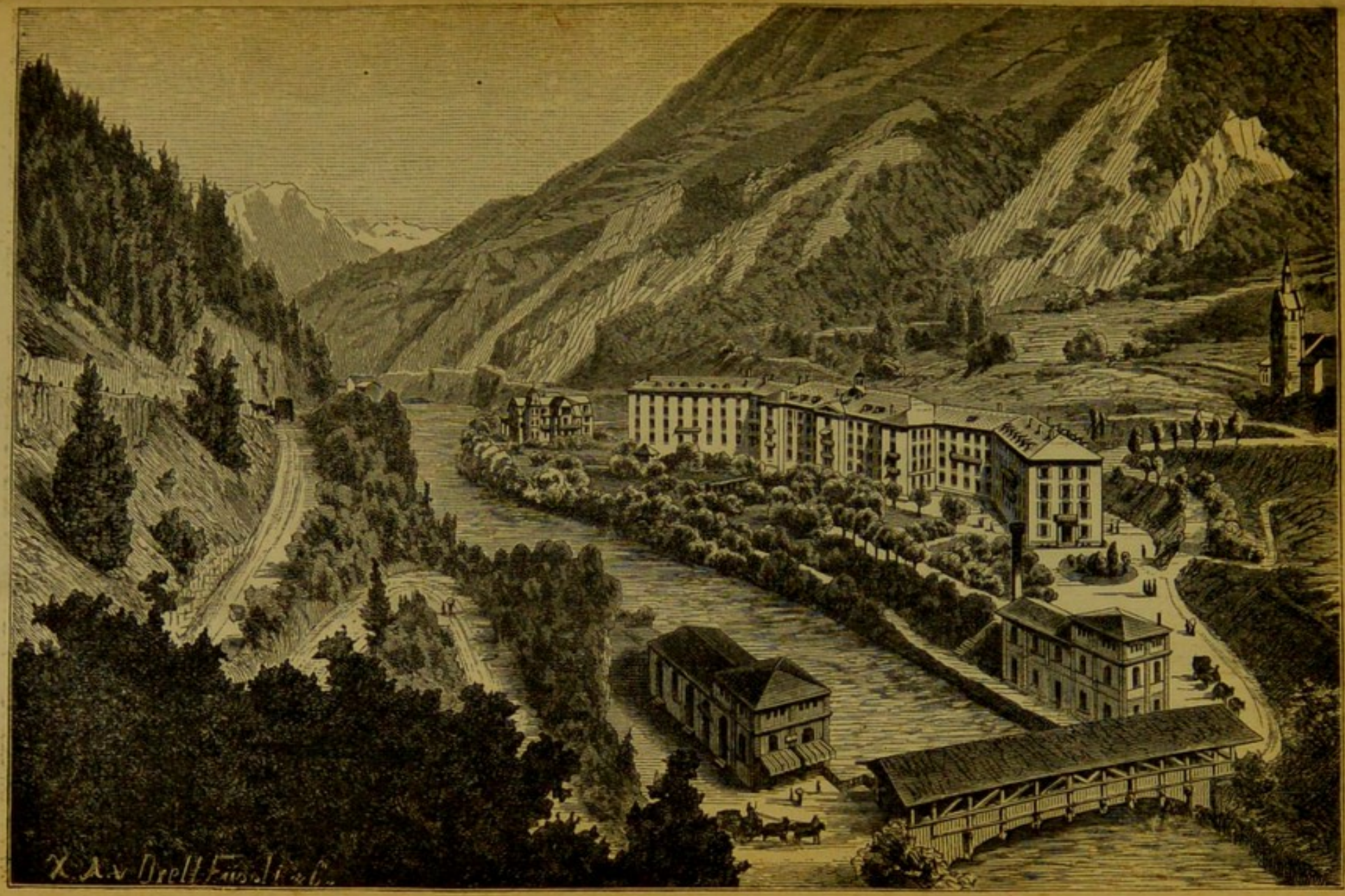
(Tarasp-Schulser Gesellschaft). Nevertheless the health-resort consists of three different and independent parts: the *Kurhaus Tarasp,* the village of *Schuls,* and the hamlet of *Vulpera,* all of which we will now proceed to describe.

1. The Kurhaus Tarasp

(3886 feet above the sea)

was completed in 1864, and stands on the left bank of the Inn, on Schuls territory. It is separated from the river by a large and shady garden, and lies on the high-road, occupying the only extensive plot of land in this extremely narrow part of the valley. The building, which from an architectural point of view is remarkable for its grand proportions, has a southern aspect, and overlooks a garden thickly planted with beautiful trees. The main edifice is flanked by two wings, which join it at a slight angle.

In the eastern wing two floors are appropriated to the *Baths.* The lower story contains 30, the upper story 26 bath-rooms, and in addition each floor has a douche-cabinet arranged in so convenient a manner that the temperature of the water spouting from the downward, upward, and lateral jets can be regulated with great exactness. From the different pipes every bath-tub can be supplied at pleasure with ordinary fresh water, or with acidulous-chalybeate or alkalo-saline mineral water. Over many of the tubs, some of which are of metal and others of wood, a powerful douche apparatus is fitted. A steam-engine fixed in a neighbouring building pumps the different mineral waters from the springs into carefully-closed reservoirs, from which they flow into the pipes; and at the same time the engine supplies the necessary steam for heating the baths, this being now effected by a new and ingenious modification of Schwarz's method. Coils of closed copper pipe, almost covering the bottom of the tubs, are so arranged as to be easily and rapidly connected with the steam supply pipes; the steam, in its passage through the coiled pipes, heats



KURHAUS TARASP.

the mineral water in the course of a very few minutes to the highest temperature ordinarily employed for baths, without agitating the water and so driving off a part of the carbonic acid contained in it, and without allowing the condensed steam to enter into and dilute the bath water. The heating having been rapidly accomplished in the manner described, the coils of piping are easily detached and removed by the attendants.

From the Baths a doorway leads directly into the beautiful *Kurhaus Garden,* whose broad walks, extending to the embankment along the river-side, and overshadowed by the thick foliage of the trees, offer a capital opportunity for the exercise which is so refreshing after a bath. Arbours overrun with climbing plants, pretty summer-houses, and numerous comfortable seats afford an abundance of pleasant resting-places in the sheltered grounds, which are further ornamented by a fountain.

From the very beginning of the season a specially engaged *band of musicians* plays every morning in the Trink-halle, and in the afternoon and evening in a newly-built *Music Pavilion* in the main promenade of the garden. These orchestral productions are varied from time to time by concerts and dances. Visitors find further entertainment in the different pastimes provided for in the grounds, which contain among other things, in a conveniently secluded spot, a roofed and asphalted *nine-pin alley.* Opposite the music pavilion, adjoining the western wing of the main building, is a newly-erected *Café-Verandah* of glass and iron-work, in which visitors take their breakfast in the morning and other refreshments during the day.

The *Kurhaus building* contains various public rooms. On the first floor is the spacious and lofty dining-hall, remarkable for its beautiful and costly panelled ceiling, and adjoining it is the restaurant, in which meals are served *à la carte.* On the ground-floor is the billiard-room, a café-restaurant, and a music and ladies' room. Among the 160 apartments of the Kurhaus are comprised numerous spacious bed-rooms

with alcoves, and several *private drawing-rooms*, most of which latter have a southern aspect and are provided with balconies (see illustration facing this page).

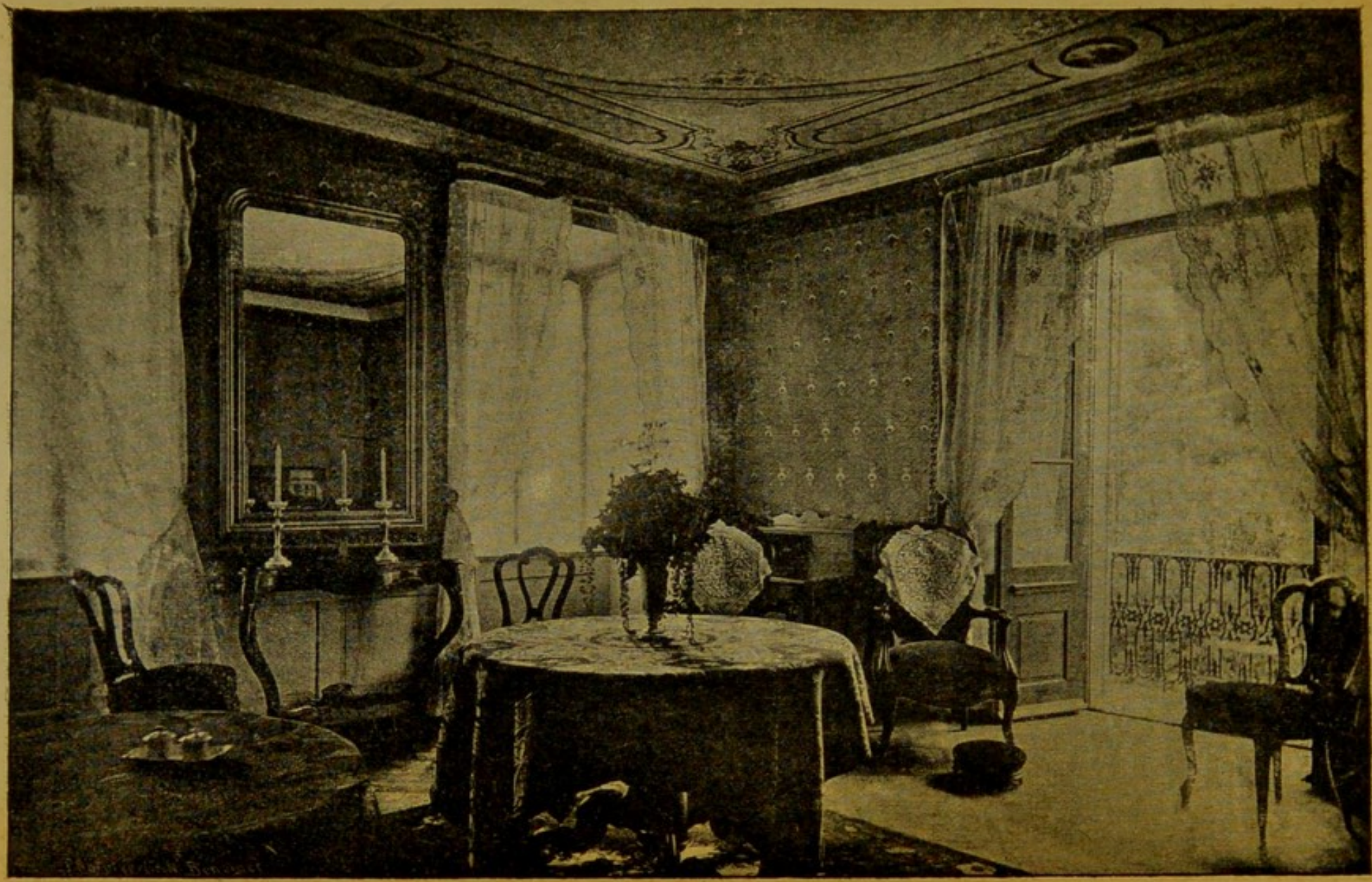
In addition to the numerous newspapers and periodicals to be found in the public rooms, the hotel office contains a collection of books (in various languages) to which visitors have free access, and which afford diversion on rainy days. The establishment also contains its own *post* and *telegraph office*, and in the stables, situated at a short distance from the Kurhaus, on the road to Ardetz, *horses and carriages* for excursions and drives are held in readiness. (Prices according to a fixed tariff).

In connection with the Kurhaus, at a short distance from it, and open on three sides to its grounds, stands the *Villa* (see illustration p. 19), containing comfortably furnished suites of rooms which are very convenient for entire families. The numerous balconies and the corner rooms with bay windows adjoining some of the drawing-rooms add greatly to the attractiveness of the Villa (see illustration p. 17).

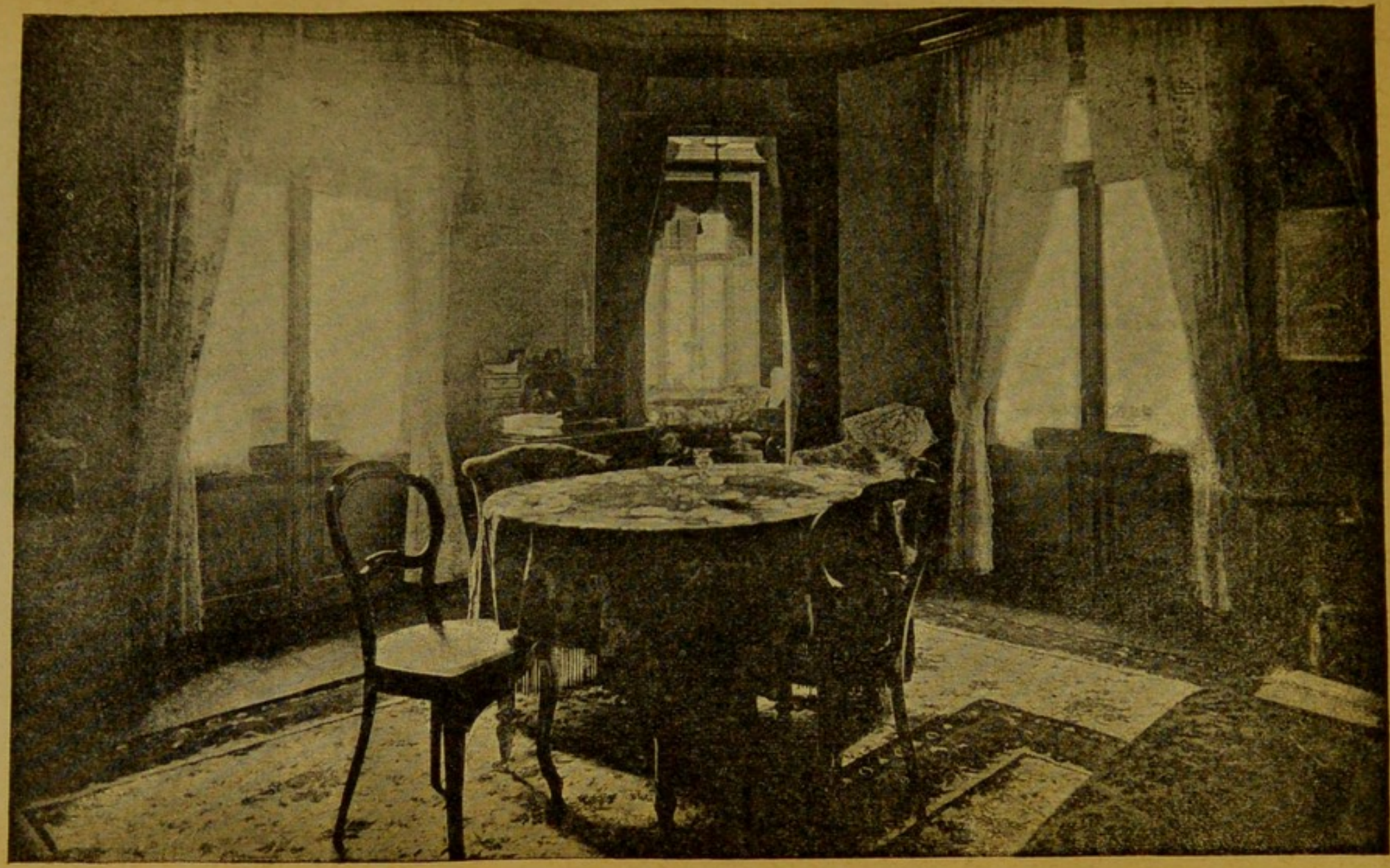
Last year the *electric light* was introduced throughout the entire establishment. The grounds are illuminated by six large arc lights of 100-candle power each, and the apartments by about 500 incandescent lights of 16-candle power (Swan's system).

As a precaution in the event of the casual introduction of infectious disease into the health-resort, a small hospital has been erected on an isolated hill known as the *Baraigla*, about a mile and a half from the Kurhaus. Fortunately there has hitherto been no occasion to make use of this building for the special purpose it was intended to serve, and as it commands a magnificent view of the neighbouring Castle of Tarasp and the mountains rising in its rear, it has been converted for the nonce into a *restaurant*, and is now a favourite resort of the visitors at the watering-place.

The present *hygienic* and *sanitary* arrangements of the Kurhaus leave nothing to be desired. The entire area has



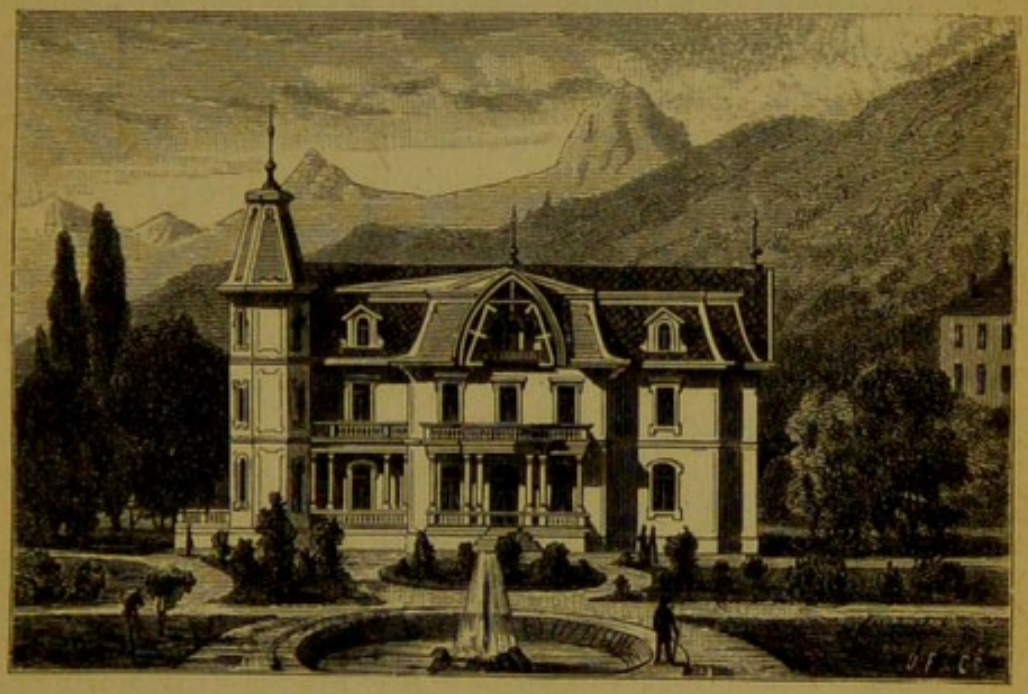
Private Drawing-Room in the Kurhaus.



Private Room in the Villa.

recently been provided with drain-pipes on Waring's system, and by the employment of automatic rinsing-basins all the refuse, excrementitious matter, rain-water, etc., is at once removed. The water-closets are fitted up on one of the most approved English methods (Jenkins' Patent), and are plentifully supplied with water, while the cess-pools are carefully ventilated.

Even the steep northern acclivity in the rear of the Kur-



VILLA-DEPENDANCE

haus is as far as possible planted with shade-giving trees and thick shrubs. A newly-constructed footpath leads up the slope at an easy incline, then to the right to the interesting "mofettes"—fissures discharging carbonic acid gas—between the Kurhaus and Schuls, or to the left up to Fettan. In the eastern angle, not far from the high-road, stands the handsome new English church.

A few steps bring us to the roofed bridge over the Inn. Adjoining it, on the opposite bank, to the right, is a small building containing several shops. In the basement of this

house rises the *Carola-Quelle,* the water of which is pumped over to the Kurhaus. To the east of the open space in front of this building stands the spacious *Trinkhalle,* which was completed in 1876. (See Illustration on the cover.) Entering the western doorway we find ourselves in a covered promenade, 300 feet in length, enclosed on the river frontage by numerous high glass windows, and occupied on the opposite side by a row of tastefully-arranged shops. From here a short flight of steps leads down to a semicircular lobby, on the wall of which we read the inspired lines of a former constant visitor to Tarasp, the late well-known and admired German novelist Berthold Auerbach:

"Die Alpenluft voll Heileskraft,
Heilkräft'ger Quell im Grunde,
Vereint Dir neues Leben schafft,
So athme, trink', gesunde!"

which we may venture to render:

"The mountain air with healing fraught,
A spring that strength doth give,
Combined renew both life and health;
Then breathe, and drink, and live!"

Immediately adjoining is the imposing Rotunda, 66 feet in height, tastefully decorated with stucco-work, and surmounted by a handsome cupola. Here we find two excellent glauber-salt springs, the *Lucius* and *Emerita-Quellen,* rising with considerable force and pouring their waters into marble receptacles. On the wall behind them we read the very appropriate punning Latin motto: *"Aëre sale, salus aerea"*. The rotunda and anteroom are provided with apparatus for heating the cold mineral water when necessary. Bottles filled with pure warm water, or with warm milk of excellent quality, are placed in this heating apparatus, and afford individual patients such additions to their daily draught as the doctor may have prescribed. A table here is also devoted to supplying the

freshly-drawn waters of the various chalybeate springs of the health-resort. Beyond the rotunda a continuation of the building contains the necessary localities for bottling and packing the mineral water for export.

Close behind the Trinkhalle we enter the cool and refreshing shade of a dense forest, intersected by a broad footpath, which afterwards divides into two branches, one leading up the heights by a gentle ascent to Ausser-Vulpera, and then down to the banks of the Inn at the point where a small bridge crosses the river, while the other branch skirts the steep and rocky river-bank and reaches the same point by an almost level route.

The *Promenade* also extends in a westerly direction from the Trinkhalle, following the upward course of the river, and soon reaching a pretty grove of alders, which has been converted into a charming natural park, provided with numerous cosy resting-places. From here a convenient footpath leads up the thickly-wooded slope to the hamlet of Florins on the plateau of Tarasp, while by a lateral branch Inner-Vulpera may be reached.

Owing to its deep situation in the narrow valley the Kurhaus and its vicinity cannot boast of a very extensive view. Only the huge, serrated Lischanna, and its slenderer but less rugged neighbour Piz St. Ion, tower in all the majesty of their sheer grey cliffs above the rounded spurs of the nearer mountains, which open somewhat in the direction of Schuls. But this slight drawback in the situation of the Kurhaus is more than counterbalanced by the great advantages afforded by the presence of the mineral water in the house itself, and the immediate proximity of the most important of the waters which are employed internally, both glauber-salt and chalybeate springs; especially during inclement weather this advantage is not confined to such as are seriously ill, but is shared by all the visitors. Then again the situation of the Kurhaus brings with it another striking advantage in the shape of a mild local climate and shelter from bleak winds. As a result

of this, patients are often able to enjoy the open air, in the Kurhaus garden, until late in the evening. The rapid river traversing the valley secures thorough ventilation. The abundant shade afforded by the Kurhaus grounds, and by the extensive woods in the immediate vicinity, is also a point of considerable importance.

If now we strike into one of the woodland paths – choosing that already mentioned as leading from the Trinkhalle along the river-bank—we soon reach a little bridge which conducts us across the Inn not far from the point where the foaming torrent of the Clemgia, whose water-power is here utilised in driving a picturesquely-situated sawmill, falls with headlong haste and deafening uproar into the river. On the further side the path leads up a gently-sloping acclivity to a spacious and pleasant plateau, till, continuing our walk between flourishing corn-fields, we arrive, in about half-an-hour after leaving the Kurhaus, at Schuls.

This village may now be more conveniently reached, however, by the high-road, which was widened last year to meet the requirements of the increasing traffic, and provided with an iron balustrade. The ascent is a very gentle one, and Schuls is reached from the Kurhaus in rather less than half-an-hour.

2. Schuls.

(Romansh "Scuol").

The village, which at the last census, taken in December, 1880, had a population of 913, occupies a sheltered situation on gently sloping ground, and is divided into two parts.

The modern hotels and "pensions", as well as the newer private houses of Ober-Schuls (4078 feet above the sea) are situated on the high-road.

About fifteen minutes' walk from the west end of the village we find on the grassy northern slope a chalybeate spring known as the *Wy-Quelle*, exceedingly rich in carbonic

SCHULS

acid. Close to the spring, on a little eminence, stands a pavilion, open on all sides, and commanding a really enchanting prospect.

At the east end of Ober-Schuls, not far from the high-road leading to Sent, there issues from the rock another mineral spring unusually rich in carbonic acid, called the *Sotsass-Quelle*.

The greater part of the water of the Wy-Quelle is conveyed in iron pipes down to the *Baths at Schuls*. The *Badehalle*, as it is called, is a tasteful one-story building situated on an open terrace of meadow-land between Ober and Unter-Schuls, facing the south. The entrance-door leads into a large hall occupying the entire middle portion of the building, and flanked by two wings, each containing 9 spacious, lofty bath-rooms and a douche-cabinet. In this establishment only chalybeate and ordinary fresh-water baths and douches can be provided. With this exception the arrangements are the same throughout as in the Kurhaus Tarasp, to our description of which we therefore refer the reader.

Unter-Schuls (3969 feet above the sea) is in part grouped picturesquely around the steep rocky eminence which affords so commanding a site for the village church. From the lower end of this portion of the village a roofed bridge leads across the river to the right bank, which is clothed down to its very brink with umbrageous fir woods. In their refreshing shade delightful paths conduct us to the romantic glade of St. Ion, at the foot of the mountain of the same name. From here the ascent of Piz Lischanna is easily accomplished, a footpath leading to the very summit, which commands a magnificent panorama; or we may penetrate into the wild and romantic Scarl-Thal through the dense forests above the ravine of the Clemgia. Below, a shady path leads along the river-bank to the little hamlet of Pradella.

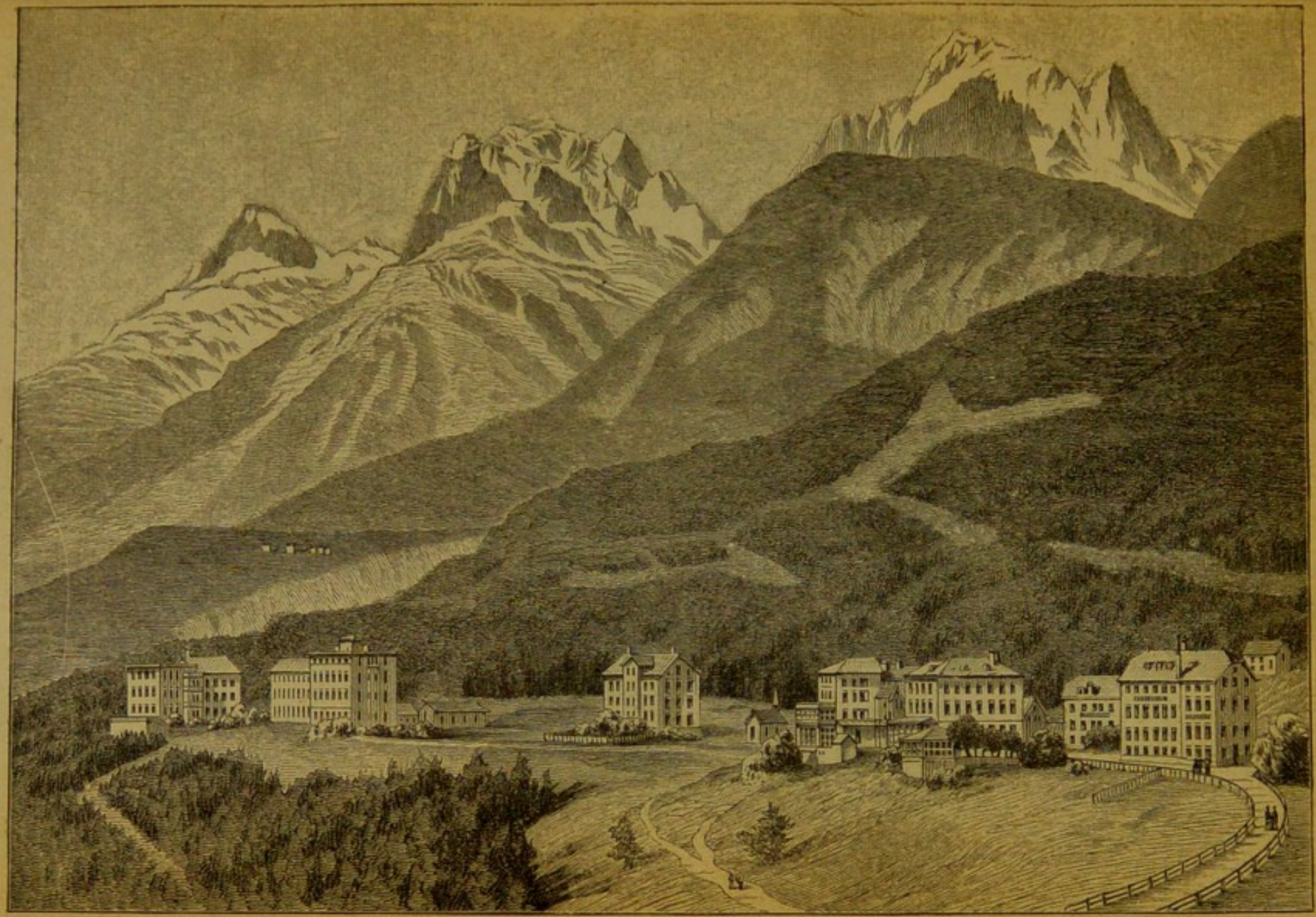
Thanks to its situation in a hollow of the mountain-side, Schuls is but little exposed to the wind, and the mildness of its climate—taking into account its considerable elevation above

the sea-level — is proved by the circumstance that apple, pear, and cherry-trees ripen their fruit in the neatly-kept little gardens attached to some of the houses, while even a small number of poplars are to be found flourishing in different parts of the village. It is true that the left bank of the river and the vicinity of the village are deficient in shade and in plantations of trees, but as an offset to this drawback Schuls enjoys an enchanting prospect in all directions. The most striking feature of the panorama is the stupendous rocky wall in the south; while the foreground is formed by the pleasant hamlet of Vulpera and the verdant, hilly plateau of Tarasp.

The combination of facilities for the internal and external employment of the chalybeate waters with a salubrious Alpine climate renders it easy to carry out in Schuls a complete course of strengthening treatment with chalybeate waters, while the convenience of other visitors is at the same time as far as possible provided for by the gratuitous service of omnibuses and other vehicles circulating during the morning between Schuls and the Trinkhalle at Tarasp.

3. Vulpera.

Vulpera, 4166 feet above the sea, stands on a narrow strip of green and flowery meadow-land, surrounded on three sides by woods resembling natural parks. The hamlet consists of two perfectly separate groups of houses, Inner and Ausser-Vulpera, which are composed almost entirely of hotels and boarding-houses, together with a few peasants' cottages. Near Inner-Vulpera, in the midst of a meadow, stands a little chapel, in which Roman Catholic services are frequently performed during the summer. From the Kurhaus a carriage-road winds in repeated zigzags up to Inner-Vulpera and beyond it to Tarasp-Fontana, while a level road, intersecting the beautiful pastures, connects Inner and Ausser-Vulpera, and ends in a somewhat rugged road leading to Schuls across the Clemgia-Gorge and a plateau bordering it.



VULPERA

Vulpera, too, thanks to its open situation, commands a superb prospect, and although the magnificent rocky ramparts in the south do not show themselves here in their full splendour and vastness, we are attracted so much the more by the charming view of the sunny fields on the north side, with the stately villages of Fettan, Schuls, and Sent.

"QUIET AVRONA."

The climatic advantages of Vulpera consist in its proximity to forests, in its lofty and open situation, and in the purity of its atmosphere, which is remarkably free from dust particles. Several favourite excursionist-resorts on the plateau of Tarasp may be most conveniently reached from Vulpera; among them we may name Tarasp-Fontana, the neighbouring eminence of the Kreuzberg, commanding a magnificent panorama, the secluded Schwarze See, situated on a lofty, forest-girdled terrace, and quiet Avrona (see illustration), high above the ravine of the Clemgia.

II. The Remedies of Tarasp-Schuls.

In the course of treatment prescribed to invalids at Tarasp-Schuls, as at other watering-places, it is by no means a question of the existence of specific remedies for certain maladies; on the contrary, as Kisch[1] correctly observes, everything depends upon the method of treatment. With regard to the regulation of the hygienic conditions, especially of diet, clothing, mode of life, and outdoor exercise, the treatment must be carried out exactly in the same manner and with the same strictness as is now general in ordinary medical practice. And if, notwithstanding the essentially analogous treatment, the results obtained at the health-resort are often relatively more favourable, we must ascribe this chiefly to the circumstance that important hygienic regulations cannot be so strictly conformed to by a person who is engaged at home in his ordinary occupations as by one who is staying quiety at a health-resort. Besides, a visit to a watering-place or climatic health-resort immediately brings into play several other very important therapeutic momenta, such as the journey, the completely changed mode of life, and the psychic influences which these jointly exercise.

By the opening of the Arlberg Railway access to our health-resort has been greatly facilitated (see under "Routes"). From the nearest railway station, *Landeck*, in the Tyrol, Tarasp-Schuls can be reached by an eight hours' drive, following the upward course of the River Inn, and *without crossing a mountain-pass*. From *Paris* Landeck may now be reached in about *20 hours* by the "lightning express" through trains, provided with extremely convenient carriages, running between Paris and Vienna viâ Basle, Zurich, and the Arlberg.

In order to reach Tarasp-Schuls, situated as it is midway in the long valley of the Inn, which runs parallel to several

[1] E. H. Kisch, *Grundriss der Klinischen Balneotherapie*. 1883. pp. 25 and 339.

of the loftiest Alpine chains, the visitor, from whichever direction he may approach, must necessarily traverse extremely interesting and romantic mountainous regions, where not only the refreshing air but also the grand surroundings and the constant change of scenery have a stimulating effect upon the mind.

In Tarasp-Schuls itself the co-operating *psychic influence* is considerably heightened on clear and refreshing summer days by the fresh and enchanting beauty of the mountain world, here unfolding itself in rare majesty and splendour, and by the bright sunny glow and variegated colouring of the lovely landscape. The magnificent mountain scenery in the environs of the health-resort is replete with varied natural beauties, affording abundant opportunity for *delightful and highly interesting walks* and drives, as well as for longer excursions. With the sublime and peaceful repose of the entire landscape the *unassuming and simple mode of life* in vogue at the health-resort is in complete harmony. Everything necessary and desirable in the way of comfort is provided, but Tarasp-Schuls neither is nor pretends to be a "fashionable watering-place".

Besides these general hygienic factors, whose share in the success of treatment is, although indisputable, difficult to measure, the chief and most important influence is attributable to the *special remedial agents* which characterize the health-resort as such, and the precise effect of which is more easily estimated,— the Alpine climate, the glauber-salt and various chalybeate springs, and the alkaline and chalybeate baths abounding in carbonic acid. In spite of the very remarkable efficacy of these springs—sufficiently confirmed by long and varied experience in their use—we put the *Alpine climate* in the foremost rank and have no hesitation in according it the first place, since its plainly perceptible, strengthening, and bracing influence is beyond doubt chiefly instrumental in producing rapid and complete success in individual cases and even in whole classes of diseases, seconding in a most decided and permanent manner the course of treatment with the mineral

waters found here. Accordingly *the Alpine climate of Tarasp-Schuls forms an essential and prominent point of distinction between it and every other health-resort in Europe possessing alkaline waters,* so that the fullest consideration must in the first place be paid to the *climate* in tabulating the special indications and contra-indications,— quite apart from the fact that the favourable climatic conditions of Tarasp-Schuls stamp it as an admirable representative of *Alpine summer health-resorts.*

A. The Alpine climate of Tarasp-Schuls.

1. The Physical Properties of the Climate.

Latitude being the same, the climate of places is influenced in a most striking manner by their elevation above the sea-level, manifesting itself in a corresponding *decrease of atmospheric pressure.* For the Kurhaus Tarasp (3871 feet above the sea) the mean height of the barometer has been determined by Dr. Killias, on the basis of observations continued for many years during the summer season (June 15 to September 15) at 660 *mm*[1] (25·98 in.). The present Meteorological Station at Schuls has been established but a few years, and only the observations for 1881—1883 and 1885 are available;[2] from these it appears that for the four months June-September the mean atmospheric pressure was 657·5 *mm.* (25·87 in.). In Tarasp-Schuls, where 4000 feet of the lowest and densest aerial strata are wanting, the atmospheric pressure is therefore diminished by four inches in comparison with that prevailing at the level of the sea, so that it amounts to approximately one-seventh less.

Another very general meteorological phenomenon is the *decrease of atmospheric temperature with altitude.* Owing to the diathermic properties of the atmosphere it is warmed only

[1] Dr. Killias, *Rätische Kurorte und Mineralquellen.* Coire 1883.
[2] *Schweiz. Meteorol. Beobachtungen,* vols. XVIII. XIX and XX.

in a very slight degree by the direct rays of the sun. It derives its warmth principally from the heat radiated from the earth's surface in the form of so-called "dark rays", and these are most completely absorbed by the lower aerial strata, which are the densest and the richest in aqueous vapour, so that as a general rule the temperature at a given elevation falls in proportion to the rarity of the air and the decrease in the quantity of aqueous vapour contained in it. According to Hann[1] the temperature in the Alps falls one and a half times more rapidly in summer than in winter, the diminution amounting to 0·38°[2] per 1000 feet, or 1° of Fahrenheit for every 260 feet of ascent; but in gradually-descending, elongated mountain valleys like the Engadine the decrease in temperature is less rapid. Besides, the mean temperature of a place is greatly influenced by its orographical conditions, exposure, and relative moisture, as well as by the neighbourhood of forests, etc. That unusually favourable conditions exist in the *Lower Engadine,* is proved by the following comparative table[3] between the two villages of *Guarda* in the Lower Engadine and

Table I.

Mean of Eight Years' Observations	Guarda, Lower Engadine 5413 feet above the sea			Scanfs. Upper Engadine 5413 feet above the sea		
	Mean	Mean Max.	Mean Min.	Mean	Mean Max.	Mean Min.
Annual mean . .	39·3	76·6	-2·4	35·2	77·0	-15·5
June	52·2	72·5	35·2	49·5	71·1	30·8
July	57·4	77·9	40·8	54·0	76·5	33·6
August	54·3	73·6	38·3	52·6	72·7	30·2
September . . .	50·9	71·1	33·3	48·3	69·1	28·8
June-September .	53·7	73·8	36·9	51·1	71·6	30·9

[1] Jul. Hann, *Handbuch der Klimatologie.* Stuttgart, 1883, p. 154.
[2] Temperature is given throughout this work in degrees Fahrenheit.
[3] Compiled from the *Jahresberichte der Naturforschenden Gesellschaft Graubündens,* vols. XI—XIX, for the years 1861—1868 and 1870—1873.

Scanfs in the Upper Engadine, which, besides being situated in the same latitude, are also at precisely the same elevation above the sea-level.

The respective observations were made with similar instruments supplied by the Grisons Natural History Society, and at the same hours of the day (5 h., 1 h., 9 h.). From this table it appears that Guarda, though at the same mean elevation as Scanfs, is absolutely warmer than the latter place, having an annual mean temperature 4·1° higher.

The conditions of temperature at the health-resort of Tarasp-Schuls are still more favourable, seeing that it lies more than 1200 feet lower than Guarda. In drawing a parallel between it and the Upper Engadine we have unfortunately very scanty materials at our disposal, since on the one hand the long-continued observations at the Kurhaus Tarasp only cover the period from June 15 to September 15, while on the other hand, of the observations conducted at the present Swiss Meteorological Station in Schuls we have only those for the years 1881—1883 and 1885.[1] But these may be compared with the similar observations made during the same years at the meteorological station at Bevers, in the Upper Engadine, situated like Schuls on the sunny left bank of the Inn, the result being as follows:

Table II.

1881—1883 and 1885	Schuls (4078 feet above the sea)					
	7 h.	1 h.	9 h.	Mean	Mean Min.	Mean Max.
June	52·5	65·3	54·5	57·4	40·3	79·8
July	56·5	69·0	57·5	60·9	45·8	80·6
August	53·0	67·6	56·1	58·8	43·5	81·1
September . . .	46·4	58·4	48·5	51·1	35·4	70·5
June-September .	52·1	65·0	54·1	57·0	41·2	78·0

[1] The record of observations in Schuls in 1884 is incomplete and useless.

Table III.

1881—1883 and 1885	Bevers (5626 feet above the sea)					
	7 h.	1 h.	9 h.	Mean	Mean Min.	Mean Max.
June	49·1	61·8	50·5	53·7	36·8	75·4
July	52·7	66·5	55·2	58·1	41·7	77·5
August	48·7	64·6	52·7	55·2	40·1	77·9
September . . .	42·2	55·7	45·7	47·4	31·0	69·6
June-September .	48·2	62·2	51·0	53·6	37·4	75·0

If now we compare the mean temperatures for the single months and for the four months together, we shall find the changes in temperature at the two stations to run nearly parallel, since the means for the months of June, August, and September show exactly the same difference in favour of Schuls. But the month of June—and to this we would call special attention in view of the still prevalent prejudice which insists upon considering the conditions of temperature of Tarasp-Schuls as identical with those of the Upper Engadine—exceeds in its mean the average temperature of Bevers for the four months June-September; this is a sufficient proof that a course of treatment in Tarasp-Schuls may well be entered upon early in June. Through the courtesy of Dr. Killias we are able to present in Table IV. the results of that gentleman's own observations in the Kurhaus Tarasp, extending over many years, with the mean temperatures as calculated by himself; owing to the much longer period of observation, they naturally differ somewhat from the means given above for Schuls.

The mean temperature given for the season, 56·93°, may well be taken as the normal average temperature of the season, since even the highest and lowest seasonal mean observed in 23 years did not differ from this by 4°. The absolute extremes, 87·1° and 33·8° represent the "absolute fluctuation

Table IV.

Conditions of Temperature at the Kurhaus Tarasp.

According to 23 years' observations by Dr. Killias, for the 4 months June 15 to September 15 in each year.

1884—1886	Mean Temperatures	Mean Extremes	
		Max.	Min.
June (15-30) . . .	55·11	74·4	44·2
July	60·69	80·2	46·7
August	58·06	77·2	43·8
September (1-15) .	54.68	70·7	41·5
Season	56·93	—	—

of temperature",[1] which is thus seen to be considerable in the Lower Engadine, and in this respect Tarasp-Schuls quite maintains the character of a *mountain climate;* nevertheless the fluctuations for Tarasp-Schuls are smaller than for the Upper Engadine, and the mean minimum temperatures never fall so low in comparison. This agrees also with the statement of Killias [1], that the *mean daily fluctuation of temperature* for the Kurhaus Tarasp amounts to 14—16°, while according to Ludwig [2] ten years observations in Bevers give a mean daily fluctuation of 22° for the months of June-September.

Owing to the smaller capacity of cold air for the absorption of moisture, the low temperature at elevated points is also necessarily accompanied by a *decrease in the amount of aqueous vapour,* which diminishes, however, in more rapid proportion than the atmospheric pressure. According to observations at the Kurhaus Tarasp the mean *absolute moisture,*

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[1] The extreme limits between which the mean temperature of the single months has fluctuated.

[2] Killias, *Die Heilquellen und Bäder von Tarasp-Schuls*, 9th edition, Coire, 1886, p. 17.

[3] J. M. Ludwig, *Das Oberengadin in seinem Einfluss auf Gesundheit und Leben*, Stuttgart, 1887.

or "vapour pressure", amounts to 7—9 *mm.* The *relative moisture,* on the other hand, which only expresses the proportion of the amount of aqueous vapour present in the air to the amount possible under the existing temperature of the air, is not influenced by the altitude of a place. But a considerable variation in the relative conditions of moisture takes place in correspondence with the previously-mentioned fluctuations of temperature. If we again compare the analogous data of Schuls and Bevers for the four years 1881—1883 and 1885, during the months of June-September, we get the following means:

Relative Moisture
expressed in per cent.

	7 h.	1 h.	9 h.	Mean	Min.
Schuls	80·3	55·6	76·4	70·8	13
Bevers	82·4	44·6	78·8	68·6	14

The means of the two stations are almost the same: at both quite extreme minima were observed. The fluctuations are, however, somewhat less for Schuls. According to the classification of Hermann Weber [1] we have in the middle of the day a very dry, in the morning and evening a moderately damp atmosphere. For a proper appreciation of the relative moisture a comparison should be made with the respective means of temperature as given in Table II.

It is true that the *amount of evaporation* is determined by the relative moisture; but in a mountain climate the former is of itself more considerable, "because the diminished atmospheric pressure produces a much more rapid diffusion of the aqueous vapours formed, and therefore accelerates evaporation". In consequence of the high degree of insolation on lofty mountains, extreme dryness of the air prevails during fine weather. This produces a remarkable transparency of the atmosphere, unusual at lower levels, and often deceiving visitors into a false estimate of distances.

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[1] Herm. Weber, *"Klimatotherapie"* in Ziemssen's *Handbuch der allgemeinen Therapie,* vol. II. part I., p. 25.

The *mean Overclouding* at *Schuls,* as recorded during the same years and months as above, was at 7 a. m. 4·8; at 1 p. m. 5·9; at 9 p. m. 4·9, and the daily mean throughout the summer months was 5·2;—almost exactly the mean calculated by Hann,[1] from abundant records of observations, for the summer at an elevation of 4300 feet. *Fog* has scarcely ever been observed at the bottom of the valley.

Since the atmospheric pressure at Tarasp-Schuls is approximately one-seventh less than at the sea-level, and since further the amount of aqueous vapours contained in the air, as we have already seen, diminishes with the altitude more rapidly than does the atmospheric pressure, it appears that a considerable *increase of insolation* must be present here, since the densest and most humid air strata, which, according to Tyndall, chiefly absorb the sun's rays, have much less influence. In spite of the intense action of the sun, the atmosphere of the Alpine valleys remains relatively cool, since, as pointed out above, the air itself absorbs but very little of the solar heat. This clearly shows how erroneous it is to attempt to judge of a mountain climate by the temperature in the shade, since living organisms may receive great benefit from direct rays of the sun, which an ordinary thermometer, hanging in the shade, fails to register. Bunsen and Roscoe have demonstrated that the *chemical intensity of the solar rays* is also increased at an elevation. It must not be supposed that the sun emits rays of various kinds; we must bear in mind that "these rays are distinguished from one another only by the length of their waves or the difference in the duration of their vibrations, and that their various effects, appearing as light, heat, and decomposition of chemical combinations, do not lie in a specific property of the rays themselves, but in the nature of the bodies upon which they fall." The *intensity of the light* in Alpine valleys is therefore also increased. The same factors—diminished atmospheric pressure and humid-

[1] Hann, l. c., p. 179.

ity—which produce an increase of insolation at high elevations, also bring about an *increased radiation of heat*, which easily explains the greater fluctuations of temperature in such places.

There is an increase of *Rainfall*, in comparison to that of the plains, in districts where the ground gradually rises to the height of the hills flanking the Alps, and especially in such valleys as open in the direction of humid currents of air. But where lofty and massive mountains oppose themselves to the direction of the prevailing rain winds, only their outer flank has a plentiful rainfall, while the Alpine valleys situated beyond these mountain-chains, in the so-called "rain-shadow", show a much smaller amount. An instructive example of this is afforded by the health-resort of Tarasp-Schuls itself, which is one of the least rainy districts in Switzerland. Hann gives the following data regarding the distribution of the rainfall in the entire valley of the Inn:

Annual Rainfall (in inches) at

Rosenheim	Innsbruck	Landeck	*Remüs*
54	34	22	*22*

Zernetz	Bevers	Sils	Castasegna
23	31	37	57

In explanation we must remark that Remüs, in the direction of Landeck, is the nearest village on the high-road beyond Schuls, so that the rainfall of Remüs, disregarding what can be at the most but a very trifling difference, may be taken as that of Tarasp-Schuls. Hann[1] thus expresses himself in regard to this remarkable fact: "The middle of the valley of the Inn, between Landeck and Zernetz, is among the *driest districts in the Alps*. In order rightly to appreciate this phenomenon it must be borne in mind that the valley of the Inn has a lower and an upper entrance, since the watershed of the Maloja does not close the valley, which here sinks over a scarcely perceptible saddle into the Maira-Thal (Bergell). Rain thus enters the valley of the Inn from its upper and

[1]) Hann, l. c., pag. 184.

lower end, and its quantity is least in the middle portion, especially in the *Lower Engadine,* which, owing to a bend in the valley, is shut in on almost every side by vast and lofty mountain-ranges."

But a small rainfall is by no means necessarily identical with a paucity of rain-showers, nor indeed is this the case in Tarasp-Schuls. In the summers of 1881 and 1882, which were extremely rainy throughout Central Europe, and of 1883, there were noted:

Days with Measurable Rainfall:

	Schuls	Bevers
1881	40	46
1882	50	68
1883	37	61
1885	29	53

In Tarasp-Schuls, however, it is a question merely of *passing showers,* as the small amount of rainfall indicates; *really wet days,* confining one to the house, are rare. At the Kurhaus Tarasp, in the summer of 1885, Dr. Killias noted among the 47 days with measurable rainfall in the period from June 15 to September 15 only six really rainy days.

The *Winds* in Tarasp-Schuls very rarely blow with great violence. Against the cold north wind almost absolute protection is afforded by the north side of the valley, rising in several tiers of hills, outposts of the massive Silvretta group. The prevailing directions from which the wind blows vary in the different localities according to their special situation; at the Kurhaus Tarasp the commonest are the south-east and south-west winds, while Schuls often notes the east and most frequently the west wind. The Kurhaus owes its relatively very considerable freedom from wind to its situation in the trough-like hollow of the valley. Even the regularly alternating *winds peculiar to mountainous districts*—the valley-breeze by day and the mountain-breeze by night—scarcely make themselves perceived on the gently-sloping plateau of Schuls or at the still more sheltered Kurhaus. Besides, the mountain-

breeze blowing by night down the valley can be of little consequence, for on the side of the mountain-chain turned towards the valley there exist no large areas of snowfields or glaciers, so that there can be no question here of the much-maligned "glacier winds". It is probably owing, too, to the repeated bends in the valley of the Lower Engadine that the valley-breeze acquires no great force.

The *Geology* of Tarasp-Schuls has been thoroughly investigated by the late Professor Theobald. We must here confine ourselves, however, to the brief statement that both the Kurhaus Tarasp and the village of Schuls stand upon the so-called "Bündnerschiefer", a splintery and readily-crumbling variety of slate, while Vulpera is traversed by a narrow ridge of gneiss. Both these rocks are extremely porous, permitting water to flow off very rapidly, so that even after heavy rains the roads speedily become dry. The surface everywhere having a considerable inclination towards the middle of the valley and the swift-flowing Inn, the soil retains little moisture. Standing waters and marshes are entirely absent.

The extremely rich and varied *Vegetation* of Tarasp-Schuls and its vicinity bears eloquent witness to the great relative mildness of the climate. The sunny northern slope is chequered high up with flourishing fields, in which rye, wheat, potatoes, barley, and hemp thrive at an elevation of more than 5000 feet, while in Schuls even orchard trees mature their fruit. Among the grass of the luxuriant meadows and gently-sloping acclivities countless species of flowers, combining in a remarkable manner representatives both of the Alpine and the sub-alpine flora, unfold their glowing splendours to the sun, and by their brilliancy of colouring attract the attention even of persons unskilled in botanical lore. Important above all from a climatic point of view are the *dense pine forests,* covering the entire southern slope of the valley, and extending to the vicinity of the Kurhaus Tarasp and Vulpera. Besides exhaling aromatic odours, regarding the precise influence of which little is yet known, these forests always main-

tain the air of their immediate neighbourhood in a somewhat moist condition, as Ebmayer's investigations have proved.

That high degree of *atmospheric purity* which forms such an important climato-therapeutic property of the Alpine winter is not found during the summer. Still the air is considerably purer than in the lowlands. After continued fine weather, dust makes its appearance on the roads, but the frequent showers seem as if purposely designed to lay it.

We will conclude our description of the climate with the following *resumé:*

1. *As compared with the lowlands* the climate of Tarasp-Schuls is characterized as *Alpine* by the diminution of the atmospheric pressure about one-seventh, by cooler temperatures in the shade, and more important fluctuations in temperature; by less absolute moisture and greater variation in the relative moisture of the air; by augmented intensity of the sun's rays (operating in greater direct warming of bodies, and in increased light-effect and chemical action); and lastly by a more pervious and consequently drier soil.

2. *As compared with still loftier localities*, and especially with the neighbouring Upper Engadine, the climate of Tarasp-Schuls is distinguished by its *less extreme fluctuations* in temperature and relative humidity, owing partly to the weaker insolation and radiation of heat, corresponding to the lower elevation, partly to the sheltered situation of the entire health-resort and the vicinity of dense forests of coniferous trees,—a milder and more equable climate, being the result.

2. Physiological Effects.

Although the beneficial effect of an Alpine climate has been placed beyond all doubt by the annual thousandfold experience in the numerous mountain-resorts, the established physiological facts connected therewith are very few. Not that there is any lack of *theories* in explanation of the favourable influence of a mountain climate. The most popular of these

refers the effects entirely to a climatic factor, ascribing to the diminished atmospheric pressure an acceleration of respiration and of the pulse, an increased flow of blood to the skin, and so forth. But on the one hand the supposed quickening of respiration and of the pulse has by no means been constantly observed, and on the other hand it can scarcely be assumed *à priori* that the powerful regulating contrivances of our system will permit the changes in function of the apparatus of respiration and circulation, in spite of their retarding and accelerating nerve fibres, to proceed exactly according to the strict programme of a physical experiment. Others again lay too much stress upon another isolated factor,—the smaller amount of oxygen in the rarefied air. Bert and Jourdanet contend that at an elevation of more than 6000 feet there is an important diminution of the oxygen in the blood, resulting in a state of "anoxyhæmia". Lombard[1] brings into play this deficiency in oxygen even for his "lofty regions" of 3000 feet and upwards. But it would seem that no great physiological importance can be attached to this diminution, for it is an ascertained fact that at the ordinary barometric pressure only about 25 per cent. of the oxygen contained in the inspired air is consumed, and that its absorption depends not upon the law of diffusion of gases, but upon the amount of hæmoglobin in the blood, with which the oxygen forms a loose chemical combination up to the point of saturation of the blood. Then too the well-known observations of Tyndall and Frankland, demonstrating a greater activity and energy of the oxygen molecules in mountain air, militate against the assumptions of Lombard.

It is certainly useless to endeavour to construct a theory of the total effect of an Alpine climate from a consideration of its single factors. In the preceding section we have become acquainted with several other important climatic factors, which must certainly exercise at least as considerable a phy-

[1] Lombard, *Traité de climatologie médicale*. Paris 1877. Vol. I, p. 267.

siological influence as the diminished pressure of the atmosphere and the smaller quantity of oxygen.

The greatly increased evaporation, the reduced amount of moisture, and the much greater intensity of the sun's rays combine to largely increase the quantity of water given off by the lungs, the result being dry lips, a dry skin, and increased thirst. In individuals specially predisposed thereto, and under very favourable meteorological conditions, there may even arise "acclimatisation disorders" such as are described in detail by Ludwig[1] for the Upper Engadine; but it is extremely seldom that well marked cases come under observation in Tarasp-Schuls, as may be expected from the lower situation and the corresponding decrease in intensity. Very frequent, on the other hand—in some seasons almost universal—are the complaints of unquiet sleep, disturbed by oppressive and terrifying dreams, occurring not only among those who are drinking the waters, but also among patients staying here solely for the benefit of the climate.

The amount of *carbonic acid* given off, being entirely dependent upon the atmospheric pressure, must necessarily be increased in consequence of the diminished pressure of the air; and quite possibly it is also increased by the intenser sunlight. In support of this view Ludwig cites the observations of Moleschott and Marmé.

Further, although the greater evaporation and the lower temperature of the air may deprive the system of more heat, this effect is no doubt partly counteracted by the smaller amount of vapour contained in the air rendering it a worse conductor of heat.

At all events it is in our present state of knowledge of very doubtful utility to attempt to deduce the total effect of the climate from the action of its different factors; we must therefore take the Alpine climate *as a whole,* and in explanation of its proved beneficial influences we must bear in mind

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[1] Ludwig, l. c., pag. 107.

the main points distinguishing it from the climate of the lowlands; these, as we have seen, consist, together with increased evaporation and greater intensity of the sun's rays, in more rapid changes in the conditions of temperature and moisture. And since, as Braun[1] points out, organic life is dependent upon an alternation in the phases of rest and excitation, and indeed of varying excitation, we may assume that the *total physiological effect of the Alpine climate* in consequence of the greater and more rapid fluctuations of its atmospheric conditions, is an *exciting and stimulating one.* Probably, therefore, change of tissue is accelerated in the mountain air; but thorough comparative investigations regarding tissue-change, in the same persons, under the same diet, and as far as possible the same mode of life, are still wanting.

It has been proved that this stimulative effect makes itself empirically known in three directions: 1. By *increasing the activity of the skin.* 2. By, at least in the beginning, *considerably increasing the appetite* and *improving assimilation,* from which result improved blood-formation and nourishment of the entire body. 3. By *stimulation and strengthening of the nervous system.* It is further probable that in the mountain air somewhat greater calls are made upon the powers of the heart, and that this gradually leads to the strengthening of the cardiac muscle and thus to *greater force in the contraction of the heart,* which indeed has been observed by Hermann Weber;[2] this question, however, can only be decided by comparative sphygmographic and cardiographic measurements. It is further very probable that a gradual *strengthening of the respiratory muscles* may be brought about by means of a course of "lung gymnastics" such as may easily be carried out in mountain districts by the systematic use of the more or less steep ascents.

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[1] Jul. Braun, *Syst. Lehrbuch der Balneotherapie.* Fourth Edition. Edited by Dr. B. Fromm, Berlin, 1880, p. 479.

[2] Herm. Weber, l. c., p. 182.

In accordance with this stimulating and strengthening effect, the Alpine climate is of *therapeutical value* in cases where it is necessary to generally promote the formation of blood and the nourishment of the body,—above all, therefore, in *general anomalies of nutrition*, such as anæmia, chlorosis, scrofula, anæmic obesity and reconvalescence from severe illnesses. Remarkably rapid results are seen too in Tarasp-Schuls in cases of *malarial sickness*, or of debility consequent on *prolonged sojourns in tropical lands*, and these results we can only ascribe to the simultaneous and mutually supplementary influences of the invigorating climate and the alkalo-saline springs. *Nervous diseases* and *extreme nervousness*, especially if arising from anæmia or exhaustion, form a further important indication. Then again in many *diseases of the chylopoetic organs* the Alpine climate has a very favourable effect, since it improves digestion and assimilation,—for instance, in chronic catarrh of the stomach, and in many cases of sluggish abdominal circulation.

Having in the foregoing paid attention chiefly to the Alpine climate in general, we must now bring into notice as a *special climatic characteristic of Tarasp-Schuls* the great mildness of its climate, arising from the less extreme fluctuations in temperature and atmospheric moisture, due to the deep and otherwise very sheltered situation of the health-resort. Thus the effect of the climate, although *strengthening and invigorating* as the result of its 4000 feet of elevation, is far *less exciting* than that of the Upper Engadine. For this reason a visit to Tarasp-Schuls is exceedingly beneficial even to *very anæmic and highly nervous patients*, who would not be able to endure the much more exciting and stimulating climate of the Upper Engadine. Most cases of *heart disease*, too, which are universally regarded as a contra-indication for the Upper Engadine, do very well in the climate of our health-resort,—valvular diseases, of course, only when complete compensation exists. Each succeeding year sees an increase in the cases of *fatty degeneration of the heart* treated in

Tarasp-Schuls. The rapid disappearance of attacks of cardiac asthma, and the speedy facilitation of ascent of hills and stairs, point to a favourable and very efficacious influence of our climate in this respect also, while a brief stay in the Upper Engadine often immediately increases the disorders of such patients in a high degree.

Contra-indications for the climate of Tarasp-Schuls are all those diseases in which great loss of strength has supervened, and in which the patient lacks the strength requisite for accommodating himself to the ordinary fluctuations in the atmospheric conditions—advanced stages of phthisis, carcinoma, valvular diseases, etc.

After what has ben said above it is scarcely necessary to add that Tarasp-Schuls is excellently adapted for a *climatic intermediary station* to and from the Upper Engadine or Davos, whenever a visit to either of those health-resorts seems advisable.

B. The Mineral Springs of Tarasp-Schuls.

In addition to the beautiful scenery, sheltered situation, and mild climate of our health-resort, it has been gifted by Nature with an extraordinary profusion of variously-compounded medicinal springs. It is probable that few districts in Europe can boast, in so limited an area, a similar wealth of valuable mineral waters. Within the narrow boundaries of Tarasp-Schuls itself no less than *twenty mineral springs* issue from the ground; they may be classified as glauber-salt, simple or compound acidulous-chalybeate, and cold sulphureous waters, which last have never yet been utilized.

Of the springs which rise in the district of our health-resort, no more than eight are employed medicinally; *four* of these are *cold glauber-salt waters, four acidulous-chalybeate springs* of various composition. They issue without exception from the "Bündner-Schiefer" formation, which, accord-

ing to Theobald,[1] is remarkable for its veins and conglomerations of quartz and calcite, for its richness in iron pyrites, and for efflorescences of sulphate of magnesia, copperas, and other salts. It is further, as Theobald says, very noteworthy that the ridge and the trough-like hollow to the south of it, in the direction of which all these springs rise, form the continuation of an anticlinal fissure in the upper strata of the limestone and slate, through which fissure the River Inn, for a certain distance below Ardetz, pursues its course.

Before entering into details regarding the different groups of springs, we will present the reader with the following analysis of the chief representatives of these groups. (See p. 49.)

1. The Alkalo-Saline or Cold Glauber-Salt Springs.

This group includes four springs, two of which, the *Lucius-Quelle* and the *Emerita-Quelle,* are chiefly employed internally, while their overflow is used, together with the water of the *Ursus-Quelle* and the *Neue Bade-Quelle,* for the alkaline baths. The two former are by far the most important and powerful.

An analysis of the Lucius-Quelle is given in the following table. "A comparison of the chemical composition of the Emerita-Quelle with that of the Lucius-Quelle", says Husemann, "shows most conclusively that these springs are nothing else than two separate outlets of a common vein of water. Their chemical composition is absolutely indentical. With the sole exception perhaps of the free carbonic acid, which is but a mere trifle less abundant in the Emerita-Quelle, the differences in the amount of all the constituents lie within the limits of unavoidable analytical errors . . . . . The circumstance that the development of gas in the Lucius-Quelle is brisker than in the Emerita-Quelle can scarcely be regarded as indicating the amount of carbonic acid actually *absorbed;* it only shows

[1] Prof. G. Theobald, *Geolog. Beschreibung von Graubünden.* 1864. Berne. J. Dalp.

Constituents in 1000 parts. The carbonates calculated as bicarbonates.	**Lucius** Cold Glauber-salt Spring	**Bonifacius** Compound Acidulous-chalybeate Spring	**Wy** Simple Acidulous-chalybeate Spring
Sulphate of soda	**2·10044**	**0·2147**	0·0113
» » potash . . .	0·37969	0·0955	0·0109
Borate of soda	0·17220	—	—
Nitrate » »	0·00084	—	—
Chloride of lithium . .	0·00299	—	—
Chloride of sodium . . .	**3·67395**	0·0570	0·0021
Bromide of sodium . .	0·02118	—	—
Iodide » » . . .	0·00085	—	—
Bicarbonate of soda . . .	**4·87319**	**1·4610**	0·0052
» » ammonia .	0·06606	—	—
» » **lime** . . .	**2·44790**	**2·7393**	**1·7750**
» » strontia . .	0·00069	—	—
» » **magnesia** . .	**0·97973**	**0·5129**	0·1286
» **protoxide of iron**	0·02146	**0·0455**	**0·0365**
» » manganese.	0·00029	—	0·0017
Silicic acid	0·00900	0·0185	0·0192
Phosphoric acid	0·00037	—	0·0002
Alumina	0·00022	—	0·0001
Barium, rubidium, cæsium, thallium and organic matter	Traces	—	—
Total solid constituents .	14·75105	5·1444	1·9908
Free and half-free carbonic acid	2380 c.c.	1945 c.c.	1513 c.c.
Quite free carbonic acid .	1060 »	1185 »	1199 »
Analyst:	Husemann 1872[1]	von Planta 1859[2]	von Planta 1859

[1] Dr. Aug. Husemann, *Neue chem. Untersuchungen der Heilquellen von Tarasp* Reprinted from the *Neue Jahrbuch für Pharmacie.* 1873.

[2] Dr. A. v. Planta-Reichenau, *Chem. Untersuchungen der Heilquellen zu Schuls und Tarasp.* Coire 1859.

that of all the carbonic acid present in the underground channels in an unabsorbed state, the larger part seeks an exit through the Lucius-Quelle." Formerly the Lucius-Quelle was known as the "great" and the Emerita-Quelle as the "little" spring; but Huseman's measurements proved that the latter exceeds the Lucius-Quelle in volume, and the old designations have therefore long been abandoned. The temperature of the two springs (44·06° Fahr.) and their specific gravity (1.0123) are identical; the Emerita-Quelle contains 1275.4 c.c. of free and half-free carbonic acid, but of quite free only 541.7 c.c.

The foregoing analysis of the Lucius-Quelle shows its chief ingredient to be bicarbonate of soda, which is followed in a descending scale by common and glauber-salt, while considerable quantities of *earthy carbonates* are also present. According to the classification now universally adopted, this group of the Tarasp mineral waters belongs to the Alkalo-saline springs, or Soda springs containing glauber-salt. But the far from inconsiderable amount of glauber-salt contained in these waters by no means comes into such prominence as in other mineral springs of the same class, since not only is the percentage of carbonate of soda here equal to that of the most powerful simple soda waters, but the amount of sodium chloride contained in the Lucius-Quelle is in excess of that found even in some sodium chloride waters. The exceptional importance of the Lucius and Emerita Springs, and their great medicinal value, will be rendered evident by comparing them on the one hand with the most celebrated alkalo-saline springs of Europe, and on the other hand with the chief representatives of the simple soda and sodium chloride waters (Vichy and Kissingen). We subjoin such a comparison, in which we have arranged the spas according to their altitude:

Parts in 1000 parts contained by:	Elevation above the sea in feet	Total solid matters	Sulphate of soda	Bicarbonate of soda	Chloride of sodium	Cub.-cent. free carbonic acid	Analyst
Tarasp-Schuls (Luciusquelle)	**3900**	**14·7**	2·1	**4·9**	3·7	1060	Husemann. 1872
Marienbad (Ferdinandsbrunnen)	2100	10·2	4·7	1·4	1·7	1127	Gintl. 1879
Elster (Salzquelle)	1500	8·3	**5·3**	1·7	0·8	986	Flechsig. 1873
Franzensbad (Salzquelle)	1400	5·4	2·8	0·9	1·1	831	Berzelius 1822
Karlsbad (Sprudel)	1200	6·3	2·4	1·8	1·0	104	Ludwig. 1879
Vichy (Grande Grille)	750	7·9	0·2	**4·9**	0·5	160	Bouquet. 1855
Kissingen (Rakoczy)	600	9·0	—	—	**5·8**	1305 (?)	Liebig. 1856

From this table it appears that the Lucius-Quelle far surpasses all the other springs in solid constituents, and almost equals the Carlsbad Sprudel in its proportion of glauber-salt, though considerably behind Elster and Marienbad in this particular. In bicarbonate of soda it exactly equals the celebrated Grande Grille at Vichy, and in common salt it is nearly two-thirds as rich as Kissingen. Kissingen and Marienbad *apparently* surpass it in carbonic acid, but this is not so in reality, since the amount of carbonic acid (1305 c.c.) given in Liebig's analysis of the Kissingen waters includes not only free carbonic acid, but also *free and half-free carbonic acid,* of which the Lucius-Quelle contains 2380 c.c. The *total amount of carbonic acid,* as found by the analyses of Husemann and Gintl respectively, is, in 10,000 parts of water:

Tarasp-Schuls . . . . . 45·809
Marienbad . . . . . 42·401.

Corresponding to this greater total quantity of carbonic acid, the amount of the carbonates is also larger in the Lucius-

Quelle than in the other springs. The high percentage of effective constituents in the Lucius-Quelle was recognized by the first prominent writers on the subject, Osann and Vetter, and at a later period a further comparison between it and analogous springs was carried out by Lebert, Braun, Meyer-Ahrens, Helfft, Grossmann (in Valentiner's *Handbuch der Balneotherapie)* and others, the great therapeutic value of the Tarasp-Schuls glauber-salt waters being thereby indisputably established.

In turning to the discussion of the *physiological effect* of these springs, and of their separate components, (following in the main the explanations of Leichtenstern [1]), we may safely confine our attention to the predominating salts, such as are found in considerable amounts, and leave entirely out of account the ingredients present only in minute quantities, or of which mere traces are discoverable. Nor need we pay any regard to the iron, even though its amount were far greater than it is, since in a mineral water so composed, and containing such a preponderance of other—mostly laxative—salts, it is quite impossible to attribute any effect whatever to the iron. As the principal and effective constituents there remain: *bicarbonate of soda, common salt, glauber-salt,* and the *earthy carbonates of lime and magnesia.* It is these substances, therefore, which, in combination with the *very abundant carbonic acid gas,* and with the water, the common solvent of all the salts, co-operate to produce the pharmaco-dynamic effect of these medicinal springs.

By far the most abundant component of all mineral springs is of course *water,* the consumption of which in larger or smaller quantities constitutes a so-called "drinking-cure". In the case of a water so strongly mineralized as this, which generally produces a plainly laxative effect after four or five glasses have been taken, there can be no question of swallowing it in *copious draughts* with the object of thoroughly cleansing

[1] Leichtenstern, *"Allgemeine Balneologie"*, Ziemssen's *Handbuch d. Allg. Therapie,* vol. II, pt. 1.

the system and promoting diuresis. But in exceptional cases, in which it is desirable to effect an increase of the bile secretion and a corresponding decrease of the solid constituents of the bile, or in which a temporary thorough rinsing-out of the urinary organs, without the administration of large quantities of diuretic salts, seems indicated, it is advisable, by proper dilution of the glauber-salt water, to render possible the consumption of a larger quantity of water, which, owing, to the still considerable amount of carbonic acid it contains, is readily absorbed.

The effect of the water is to a great extent dependent upon its *temperature*. The mean temperature of the Lucius and Emerita Springs is 42·8°—43·7° Fahrenheit; they are therefore among the coldest drinking-springs, only St. Moritz being colder. After drinking 300 c. c. of the water at 42·8° Fahrenheit, Winternitz[1] found retardation of the pulse and signs of increased vascular tension recorded by the sphygmograph, and from this he concludes that the cold water reflexly excites the vaso-motor centres, thus inducing extensive vascular contraction. Experience in Tarasp-Schuls shows that the majority of patients cannot drink these waters at their low natural temperature, partly because in many the severe stimulus of cold almost puts a stop to the absorption of the water in the stomach, partly because in some very sensitive persons unpleasant sensations in the head, or even slight attacks of giddiness appear, — explainable by the somewhat severe temporary reflex irritation of the vaso-motor centres, not by the "spa intoxication" absurdly attributed to the abundance of carbonic acid.

The *carbonic acid* of the mineral water operates in the stomach as a local stimulant upon the mucous membrane, the nerves, and the muscular walls, thus exciting their peristaltic motion. But according to Quincke's[2] researches, the irritation

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[1] W. Winternitz, *Die Hydrotherapie auf physiologischer und klinischer Grundlage*, vol. II, pag. 420. (Vienna, 1880.)

[2] Quincke, *"Ueber die Wirkung kohlensäurehaltiger Getränke", Archiv für experimentelle Pathologie*, vol. VII, 1877.

of the mucous membrane induces in it a kind of hyperæmia, which greatly accelerates the absorption of the water by the stomach. In this manner the stream of blood passing through the kidneys must be temporarily increased in volume and velocity, whence results increased diuresis. In spite of the considerable total amount of carbonic acid contained in our springs, is is certain that only a small proportion of it reaches the blood. The carbonic acid absorbed in the water, and that combined with the salts, is liberated but gradually in the stomach, and apart from the large amount discharged through eructation, etc., it cannot, by the law of diffusion of gases, pass into the blood until the tension of the free carbonic acid gas present in the stomach is greater than the carbonic acid pressure of the blood. In the blood itself the fixation of the carbonic acid chiefly depends, as Zuntz[1] proves, upon the behaviour of the hæmoglobin alkalies, which, under the influence of high carbonic acid tension, find their way out of the blood-corpuscles into the plasma, and then by exosmosis into the tissues, while in places of low carbonic acid tension, for instance in the lungs, the reverse process takes place. This alone suffices to maintain the carbonic acid pressure in the tissues at a uniformly low point. The principal excretion, and that by which without doubt almost all the carbonic acid imbibed with the mineral water is again given off, takes place in the expiration of air,—a process which, moreover, is facilitated in our loftily-situated health-resort proportionately to the diminished atmospheric pressure. Consequently the abundance of carbonic acid in our glauber-salt springs and other mineral waters cannot effect any important accumulation of carbonic acid in the blood. Our glauber-salt springs being so extremely rich in carbonic acid, there is of course no objection to the water being warmed up to the desired temperature, and special apparatus are provided in the Trinkhalle for this purpose. (See page 20.)

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[1] Hermann's *Handbuch der Physiologie*, vol. IV, pt. 2, p. 79.

Under normal conditions the *bicarbonate of soda* is decomposed into sodium chloride and carbonic acid by the acids of the gastric juice, or, under abnormal fermentation, according to circumstances into lactate, butyrate, or acetate of soda, and the surplus acid of the gastric juice is thus neutralized. Any surplus of this salt is taken up into the blood. But even when all the carbonate of soda is converted into sodium chloride, the amount of soda contained in the blood is, according to Leichtenstern[1], nevertheless temporarily increased. So much of the soda as finds its way through the portal vein into the liver is perhaps at once turned to account there in the preparation of bile, and if this is really the case, it may afford an explanation of the experimentally ascertained but still unexplained favourable influence of soda springs upon the removal of gallstones. Increased secretion of bile, however, can only be attained by a more plentiful use of the water. By absorption of soda the alkalization of the blood can be increased but temporarily, since the surplus alkali is soon removed again with the urine, in which it neutralizes the phosphate of soda or even creates an alkaline reaction. Apart from the neutralization of surplus acid, the local effect of carbonate of soda taken into the empty stomach is to dissolve the mucus, to augment the secretion of the gastric juice, and to promote peristaltic action. Its influence upon the conversion of albumen in the body will be noticed immediately under sodium chloride, to which its behaviour is in this respect completely analogous, and its capacity for dissolving uric salts under the earthy carbonates.

Common salt or chloride of sodium, when taken into the stomach, powerfully stimulates the secretion of the gastric juice, and excites reflexly the peristaltic motion of the stomach, thus promoting the evacuation of the contents of that organ. It further facilitates the splitting off of the pepsin from the albuminous principal cells of the stomach, and thus expedites the

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[1] Leichtenstern, l. c., p. 328.

absorption of the peptones. Corresponding to its great capacity for diffusion, the common salt is for the most part absorbed in the stomach itself, and since, according to the exact researches of Voit[1], it accelerates the transudation of the juices through the tissues, thus exposing larger quantities of circulating albumen to the splitting forces of the cells, it slightly increases the conversion of albumen, as is shown by the augmented excretion of urea through the urine. In order to excrete the salt out of the body into the urine, water is necessary; but the increased evacuation of water through the urine manifests itself even though little water be drunk, since the sodium chloride has the effect of drawing more water into the urine.

To the sulphate of soda, or *glauber-salt,* Seegen ascribed an influence the contrary of the above; Emil Pfeiffer,[2] in his own experiments with the Carlsbad water, found a confirmation of the observations of Seegen, the water of the Mühlbrunnen producing in him a diminution of the solid constituents of the urine and of the urea, as well as of the total change of tissue. But these results are opposed to the reliable investigations of Voit,[3] who found that a dose of 3 grammes of glauber-salt, after equilibrium of nitrogen has been brought about, scarcely produces any alteration in the amount of water secreted in the urine, and therefore does not influence the amount of nitrogen it contains. There is no doubt that large doses increase, like common salt, the disintegration of albumen. In the stomach but small quantities of glauber-salt are absorbed, owing to its slight diffusibility; the remainder finds its way into the intestine, and here excites peristaltic contraction.

The *bicarbonate of lime and magnesia* are decomposed by the acids of the stomach into the corresponding hydrochloric and lactic combinations, carbonic acid being liberated. Their effect is thus mainly antacid. If more of these earths

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[1] Voit, in Hermann's *Handbuch der Physiologie,* vol. VI, pt. 1, p. 160.
[2] Emil Pfeiffer, *Wiesbaden oder Karlsbad? Kochsalz oder Glaubersalz? Balneologische Studien über Wiesbaden,* p. 57.
[3] Voit, l. c., p. 161.

are brought into the stomach than can be decomposed by the acid it contains, the surplus passes off unchanged with the fæces. The magnesia is aperient in its action, seconding the effect of the salts previously noticed, while the lime, on the contrary, possesses astringent properties. Recent chemical experiments, undertaken by E. Jahns[1] at the suggestion of Professor Ebstein, with the object of testing the capacity of mineral waters for dissolving uric acid, show that "the carbonates alone, both of the alkalies and alkaline earths, condition the increased solubility of uric acid in mineral waters." A considerable share of this property of dissolving uric acid must be ascribed to the carbonates of lime and magnesia contained in the waters, since, corresponding to the low equivalent of magnesia and lime, the capacity of their carbonates for dissolving exceeds that of the carbonates of soda and potash, and is but little inferior to that of carbonate of lithia. The question nevertheless remains an open one, whether the salts which prove effective in chemical experiments display the same quality on their introduction into the human system. But the alkalo-saline springs are „the most renowned antarthritic mineral waters" (Kisch), and Braun, who is as a rule no great advocate of mineral waters, emphasizes the fact that "however rarely the gouty dyscrasy is cured or even greatly alleviated, the best and most reliable results have been reported from Marienbad, and especially from Carlsbad, and latterly from Tarasp". We too, in our eleven years' experience in the treatment of English patients afflicted with this malady, have observed a decided decrease in the frequency of attacks of gout, and in some cases even their intermission for years together.

We have now exhausted the discussion of the effects of the separate constituents of the springs, and if it is asked what then are the *combined* physiological effects of the different salts, we reply that the *therapeutical operation of the Tarasp-*

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[1] E. Jahns, *"Löslichkeit der Harnsäure in Salzlösungen". Archiv für Pharmacie*, vol. 227, July, 1883; p. 511.

Schuls glauber-salt springs chiefly manifests itself in three directions, viz.:

1. *On the chylopoetic organs*: The stimulating action of the cold mineral water, fresh from the spring, of the common salt, bicarbonate of soda, and glauber-salt, produces reflexly, by irritation of the nerves of the stomach and intestine, increased peristaltic contraction. At the same time the salts, taken into an empty stomach, promote the dissolving of the mucus, and excite the secretion of the gastric and intestinal juices. In this manner the contents of the alimentary canal are rendered more fluid, and the increased peristaltic motion causes a more rapid and complete evacuation of these organs, even in case of their diminished reflex excitability or atony. Thus the causes of the venous engorgements are removed, assimilation is facilitated, and finally, though slowly and gradually, nutrition is improved. The bicarbonates of soda, lime, and magnesia fix, by their conversion into lactic or hydrochloric combinations, the free and surplus acids of the stomach, and thus exercise a powerful antacid effect.

But as, according to Heidenhain,[1] peristaltic movements of the viscera, by throwing the blood of the intestinal walls into the veins, increase the impulsive force of the flow of blood into the portal vein, this relieves the venous hyperæmia of the intestine, accompanying intestinal catarrh, corrects the defective movement of the blood out of the dilated intestinal capillaries and veins into the portal vein, and removes the plethoric stasis as a whole. By the simultaneous effect of the thus regulated blood-circulation in the abdomen and of the regular evacuation of the intestine, maladies such as hæmorrhoids, hypochondria, &c., often accompanying chronic intestinal catarrh, are considerably alleviated.

2. The *diuretic effect* of these waters is very pronounced. In the first place the large amount of carbonic acid leads to

[1] Heidenhain, in Hermann's *Handbuch der Physiologie*, vol. II, pt. 1, p. 260.

a rapid and abundant absorption of the mineral water, thus largely increasing, temporarily, the flow of blood, and promoting in a corresponding degree for the next few hours the secretion of urine by the kidneys. Secondly, all the salts introduced with the mineral water, which, in so far as they are superfluous for the system, must be excreted from it again with the urine, have the effect of drawing more water into the urine, thus increasing its amount and operating as diuretics.

3. *Upon being taken up into the blood* the alkalies, after being converted in the stomach into lactic and hydrochloric combinations, increase temporarily the alkalization of the blood and its diffusion into the tissues of the body. The blood, containing more salts, absorbs more fluid from the parenchyma through which it flows, and thus brings about augmented excretion of water and disintegration of albumen, so that temporarily a very considerable rinsing and cleansing of the system takes place, which can be largely increased by much more copious draughts of diluted mineral water, and may be turned to good account in cholelithiasis and nephrolithiasis.

The superfluous alkalies taken up out of the mineral water are again excreted with the urine, neutralizing its acid phosphate of soda, and thereby producing either neutral or alkaline reaction. The latter moderates or removes the irritation of the mucous membranes of the urinary organs by the acid urine, liquifies the mucus, and thus exercises a favourable effect upon catarrhs of the pelvis renalis, of the urinary bladder, and of the urethra.

The foregoing delineation of the principal effects of our glauber-salt springs naturally corresponds only in its main outlines to the results found in practice to follow their therapeutical employment in individual cases; the results vary somewhat according to the special characteristics of each case, and particularly according to the size of the doses and the precise mode of employment.

If *small quantities* (up to 2 glasses of 180 grammes) of the cold water are taken, the large amount of carbonic acid

so stimulates the mucous membrane of the stomach that almost complete absorption is effected, including probably the small amount of glauber-salt (in 2 glasses only 0·7 grammes). With these doses the cathartic effect is naturally slight,—perhaps owing in part to the influence of the common salt, which, by rendering the chyme more easy of assimilation in the alimentary canal, leaves less matter for the excrements. If the mineral water be taken warm in small doses at long intervals, constipation first results, as with Carlsbad water; this is attributable to the drinking of warm water, and advantage is taken of it in the treatment of cases of chronic diarrhœa, such as often come for treatment here. If the waters are taken in a very diluted form, so that the volume of fluid is large and the amount of solid ingredients small, a greatly-increased diuresis rapidly shows itself, but ceases again in the course of the same forenoon.

In *moderate doses*, from 3 to 5 glasses, taken in the morning on an empty stomach at intervals of 15 minutes, the action of the water is soon perceived in the bowels, making itself felt by a slight contraction and griping, the strongly-excited peristaltic motion pushes forward the contents of the alimentary canal, often with loud rumbling noises, and, in the course of a few hours after drinking the water, as a rule one or two pappy alvine discharges take place, with which the effect of the water in this direction is at an end for the remainder of the day. A moderately increased diuresis makes its appearance late in the morning or in the course of the afternoon.

Large doses, from 6 to 8 glasses, have a decidedly purgative action; the drinking of the water is rapidly followed by repeated thin, often watery discharges; the intense peristaltic contraction drives the entire contents of the alimentary canal quickly through it. At the same time the bile which pours into the upper part of the intestinal tube, as well as the juices secreted by the pancreas and the intestinal glands, are no longer absorbed, as they would be more or less under

normal conditions. As in this manner the proteid material of the pancreatic secretion and the sulphur and iron of the bile are withdrawn from the body, a corresponding impoverishment of the system as regards these and other constituents takes place, — as demonstrated by Zülzer,[1] in the case of saline laxatives, by the relative diminution of the phosphoric acid, sulphuric acid, magnesia, and chlorides in the urine. Thus when the water is administered in large quantities the result is what Immermann[2] well terms a "deprivative treatment", which, in conjunction with the simultaneous influence of the Alpine climate and of a strict regimen, sufficiently accounts for the efficaciousness of our glauber-salt springs in the treatment of obesity.

In cases of anæmia, of obesity accompanied by anæmia, and of debility, only small quantities (at the most three glasses) may be prescribed; if such patients continue for any length of time the use of larger doses, loss of appetite, palpitation of the heart, a feeble pulse, and signs of great weakness often appear, usually ascribed to an oversaturation of the blood with alkalies. We, however, explain these symptoms as resulting on the one hand from a too firm fixation of the scanty amounts of free hydrochloric acid in the stomach of these patients, and on the other hand from the already discussed withdrawal from the body of nutritive substances. Such withdrawal, although mild, is yet going on constantly during the course of treatment. Small doses, on the other hand, by regulating digestion, improving assimilation, and thus gradually increasing the nutrition of the body, exercise a strengthening and tonic influence.

It will readily be seen from the above how very necessary it is, in prescribing our glauber-salt waters, to pay due regard to the special character of the case under treatment.

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[1] W Zülzer, *"Ueber den Einfluss der salinischen Laxantia auf den Stoffwechsel". Vortrag in der Balneolog. Section der Gesellschaft für Heilkunde, am 25. Jan. 1879.*

[2] Immermann, *"Fettsucht"*, in Ziemssen's *Handbuch der spec. Pathologie und Therapie*, vol. VIII, pt. 2, p. 403. Leipzig 1876.

2. The Acidulous-Chalybeate Springs.

Of the numerous springs of this class rising in Tarasp-Schuls, only four have hitherto been enclosed and utilized. Analyses of the two principal of these, the *Bonifacius-Quelle* and the *Wy-Quelle*, will be found at page 49.

If only on account of the *lofty situation of the health-resort*, the chalybeate waters of Tarasp-Schuls merit the fullest consideration, since among the baths which are well-known and provided with sufficiently comfortable appliances, Tarasp-Schuls is, next to St. Moritz, the most loftily-situated place possessing chalybeate springs. In discussing the climatic conditions we called attention (see page 46) to the fact that the mild Alpine climate of Tarasp-Schuls agrees even with very anæmic and extremely nervous patients, for whom the climate of St. Moritz would prove too stimulating, besides making too great demands on their power of resistance. The influence of the Alpine climate in promoting digestion, improving assimilation and blood-formation, and stimulating the nerve-functions —thus in a most effectual manner seconding the operation of this group of springs—is far more important than the very trifling difference in the amount of iron contained in the different springs, as shown in the following tabulation of the so-called "compound or composite chalybeate springs", to which we add, for the sake of comparison with the Bonifacius-Quelle, the corresponding data for the Helenen-Quelle at Wildungen:

Name of Mineral Water	Elevation above the sea in feet	Solid Constituents	c.c. free Carbonic Acid	Sulphates of Soda and Potash	Bicarbonates of			
					Soda	Lime	Magnesia	Protoxide of Iron
St. Moritz								
(Paracelsusquelle[1])	**5800**	2·2	**1282**	**0·3**	0·2	1·3	0·2	0·039
Tarasp-Schuls								
(Bonifaciusquelle[2])	3900	**5·1**	1185	**0·3**	**1·5**	**2·7**	0·5	0·045
(Wyquelle[2]) . . .	3900	2·0	1199	—	—	1·8	0·1	0·036
Marienbad								
(Rudolfsquelle[3]) .	2100	3·2	—	0·1	0·1	1·6	0·1	0·057
Reinerz								
(Laue Quelle[4]) . .	1825	2·6	1097	—	0·8	1·2	0·3	0·037
Cudowa								
(Trinkquelle[5]) . .	1270	2·7	1218	**0·7**	1·2	0·7	0·2	0·037
Wildungen								
(Helenenquelle[6]) .	750	4·6	1351	—	0·8	1·3	**1·4**	0·019

Analysed by: [1] Husemann, 1874. [2] Planta, 1859. [3] Gintl, 1879. [4] Drenkmann, 1868. [5] Duflos, 1850. [6] Fresenius, 1859.

This table shows that of all the acidulous-chalybeate springs in question, the *Bonifacius-Quelle* contains the greatest total amount of solid constituents, as well as the greatest amount of bicarbonate of soda, lime, and magnesia, while as regards iron it is second only to the Rudolfs-Quelle at Marienbad. The Bonifacius-Quelle has a very close resemblance to this spring and to the Helenen-Quelle at Wildungen (generally classed as an "earthy chalybeate spring"), in regard to its large percentage both of solid matters and earthy carbonates; on the other hand the Trink-Quelle at Cudowa approaches its amount of bicarbonate of soda.

The *Wy-Quelle*, while containing a medium amount of

iron, is far less rich in solid constituents, among which, however, carbonate of lime again plays the chief rôle. It therefore resembles in some degree the springs classed as pure acidulous-chalybeate waters.

Of the other chalybeate springs of Tarasp-Schuls, the *Carola-Quelle* is employed almost exclusively for bathing purposes. According to the analysis made by Husemann in 1872, it contains in 1000 parts (the carbonates calculated as bicarbonates): solid constituents 1·0; bicarbonate of protoxide of iron 0·019; the free and half-free carbonic acid amounts to 1033 c.c., the quite free to 892 c.c.

The *Sotsass-Quelle* must also be considered a "simple acidulous water," since in 1000 parts the solid matters amount only to 1·7, among them being 1·5 bicarbonate of lime, and 0·017 bicarbonate of protoxide of iron; on the other hand it is remarkable for the large amount of carbonic acid it contains (free and half-free 1448 c.c., quite free 1234 c.c.). For this reason the spring is employed as a "table water" in Tarasp-Schuls, as well as in the Upper Engadine and elsewhere.

In spite of the seemingly paradoxical results of Schroff's experiments, which appear to show that small doses of *iron* convey more iron into the blood than large doses, and in spite of the possibility that in pathological conditions more iron is retained in the system than under normal conditions, it seems preferable to refer the undoubted efficacy of internal and external treatment with ferruginous springs to the other much more important simultaneous factors in this course of treatment, rather than to the specific effect of the iron, which, even in the waters richest in this ingredient, and when the largest doses—1 litre daily—are given, amounts only to 8·5 centigrammes. The mere influence of the change of climate on anæmic persons resorting to Tarasp-Schuls from the lowlands must surely be of more effect in increasing blood-formation than the minute amount of iron contained in the mineral water.

Certain it is that the beneficial results following the use of the Bonifacius-Quelle cannot be attributed to the iron it

contains, since in comparison with the much larger quantities of other salts the iron can scarcely be worth considering at all. The chief constituent is *carbonate of lime,* regarding the effect of which opinions differ considerably.

Rohden calls attention to the fact that "two chalybeate springs of extremely favourable influence upon the recuperation of a debilitated system, namely Dryburg and Pyrmont, contain a considerable amount of lime (carbonate and sulphate), and that we are just as much entitled to ascribe the effect to the large quantity of lime as to the much smaller quantity of iron." The amount of bicarbonate of soda contained in this spring exceeds that in many "soda waters" and the bicarbonate of magnesia is also present in considerable quantity. Long experience in Tarasp-Schuls confirms the efficacy of the Bonifacius-Quelle in chronic nephritis, in chronic catarrh of the bladder, and in urinary concretions, and fully accords with the indications of the analogously-composed springs of Marienbad and Wildungen, the Rudolfs-Quelle and the Helenen-Quelle.

The Wy-Quelle, which is chiefly employed in purely anæmic cases, in chlorosis, &c., probably owes its undoubted efficacy in these maladies to its richness in carbonic acid, shown by its briskly bubbling water, as well as to its usually being employed in combination with baths of water rich in carbonic acid.

C. The Baths.

Having already given a description (pp. 10 and 25) of the bathing arrangements in the Kurhaus Tarasp and at Schuls, it only remains for us to present the reader here with a few considerations regarding the *effects of the baths.* In so doing we shall in the main be guided by the opinions of Leichtenstern,[1] without attempting to gauge the value of the

[1] Leichtenstern, l. c., pag. 225.

divergent views held by other writers, and we shall discuss the respective questions only so far as they have a direct bearing upon the baths of Tarasp-Schuls.

Neither the salts contained in the so-called "alkaline baths" fed by the glauber-salt springs, nor the iron present in the chalybeate baths, can have a specific action, i.e. as salt or iron, upon the system, since it is impossible that any important quantity of these substances can be absorbed by the body from the water. On the other hand both the mineral components and the carbonic acid of the baths act as a mild stimulus upon the peripheral nerves of the skin,—the salts, in proportion to the low degree of concentration of the bath-water used in Tarasp-Schuls, having but little effect, while the carbonic acid, which is present in considerable quantities, and is preserved in the baths as far as possible by special arrangements, is more powerful in its action. It is not impossible that the stimulus thus exercised upon the nerves of the skin may also indirectly affect the more delicate processes of tissue-change, by influencing the secretions, the circulation, the movement of the lymph, &c.

The springs employed for the *"alkaline baths"* are the Ursus-Quelle (in 1000 parts 11·9 solid constituents and 1283 c. c. quite free carbonic acid) and the Neue Bade-Quelle (4·9 solid constituents, 542 c. c. quite free carbonic acid), together with the overflow of the Lucius-Quelle and the Emerita-Quelle. The *"chalybeate baths"* of the Kurhaus Tarasp are fed by the Carola-Quelle (1·0 solid constituents, 1199 c. c. quite free carbonic acid), while the chalybeate baths of Schuls are supplied by the Wy-Quelle (2·0 solid constituents, 1199 c. c. quite free carbonic acid).

Daily experience in Tarasp-Schuls teaches that the chalybeate baths are much more stimulating in their action than the saline baths; this is doubtless due in part to the much more lively development of carbonic acid in the former, but is also dependent upon the difference in temperature, since the

chalybeate baths are generally prescribed much cooler (86—72° Fahr.), the saline baths, on the other hand, tepid (95—86° Fahr.), approaching the "point of thermic indifference".

Owing to the sharp stimulus of the carbonic acid in the cool chalybeate baths, they can be taken at a low temperature without producing shivering. As long as the temperature of the body itself remains the same, as it does in baths of this temperature and duration, according to Voit [1] the stimulating influence of the cold upon the sensitive nerves of the skin produces by reflex action an increased conversion of fat or of non-nitrogenous substances, while the disintegration of albumen, and therefore the excretion of urea, undergoes no change. On entering the cool bath the sudden sensation of cold causes a deep inspiration and a momentary pause in breathing, generally succeeded by a deepening of the inspirations and a slight increase in their frequency.

The *mechanical effect of the bath* through the pressure, the contact, and the adhesion of the water can amount only to a further stimulus of the skin beyond the analogous effects of the temperature on the one hand and of the gaseous and saline matter on the other hand.

After the baths, whether tepid or cool, there ensues a further loss of temperature through the *evaporation of the water remaining on the skin*, varying with the exterior conditions, clothing, temperature, air currents, humidity of the atmosphere, &c.; at the altitude of Tarasp-Schuls the evaporation is intensified by the circumstance that both the diminished atmospheric pressure, and the relatively low degree of atmospheric moisture during the forenoon, when baths are taken, are favourable to evaporation.

Besides the "full baths" exclusively referred to above, other forms of baths are in use at Tarasp-Schuls, such as the "sitz" or hip baths employed in local affections, the process of rubbing with wet sheets, and the different kinds of shower-

[1] Voit, l. c., p. 218

baths, which are very powerful in their action, owing to the constantly renewed stimulus of cold. Arrangements have been made for the employment in suitable cases of Swedish "sanative gymnastics", and for the treatment known as "massage", which is carried out under medical superintendence by experienced male and female operators.

From the above-described physiological effects of the baths their *indications* and *contra-indications* may readily be deduced. While the cool bath leads by its stimulative action to the excitement of most of the organic functions, the blood-warm bath produces the same therapeutic result by a purely physical facilitation of the functions of the body. The selection of cases for very cool or cold forms of baths presupposes therefore a certain integrity of the vital functions, and where the patient requires very gentle treatment, or where the generation of heat is not rapid enough to compensate for the heat of which the system is deprived, baths of blood-warm or moderately cool temperature must be prescribed. In plethoric obesity, on the other hand, baths of as low a temperature as possible, and of somewhat longer duration, in order to promote the conversion of fat, are indicated.

From what we have stated respecting the effects of the baths, it is very evident that in prescribing their temperature and duration the utmost attention must be paid to the constitution and strength of patients, and to their ability to resist and recover from the sudden shock produced by the cold water.

D. The Diet.

If only with regard to the water-cure itself, which calls for the regular and uninterrupted consumption of the prescribed quantity of mineral water during a period of several weeks, it is of vital importance to guard against any disturbance of digestion. In Tarasp-Schuls, as in most other health-resorts, the spa regulations are accompanied by general dietetic instructions, containing a list of the articles of food which are considered respectively as wholesome or unwholesome for pa-

tients under treatment. It is perfectly obvious that one and the same diet cannot be suitable for corpulent bon-vivants, for weak anæmic patients, for sufferers from stomach and liver complaints, for gouty subjects, and the various other invalids who visit our health-resort. We may admit that, as Immermann[1] says, "on the whole the corpulent invalid will do well, and be likely to attain his object, if he will adhere strictly to the time-honoured dietetic rules; for the menu of the spa hotels, being kept strictly within the limits of the medical regulations, induces unwonted moderation in many a visitor who at home would scarcely have relinquished his gormandising propensities." Experience constantly shows that in most cases of illness permanent and satisfactory results can only be attained when a special diet, adapted to the peculiar circumstances of the case in question, is prescribed. The "à la carte" system, which is alone suitable for an establishment of this kind, has now been introduced into the Kurhaus Tarasp, and a special restaurant provided.

Especially in *diseases of the digestive organs*, which form the largest class of disorders treated in Tarasp-Schuls, an exact and detailed regulation of the diet is of the first importance for the restoration of normal conditions. In chronic catarrh of the stomach, accompanying a weak digestion, the amount of nutritive substances to be taken daily often has to be ascertained by careful experiment during the first days of the treatment; the amount being ascertained, it can be divided up into several light meals. In ulcus ventriculi, as well as in severe cases of catarrh of the stomach, it is advisable to have immediate recourse to one of the four dietaries recommended by Professor Leube[2] to sufferers from gastric complaints. In *chronic dyspepsia* the consumption of fat and of carbohydrates, which, in consequence of abnormal processes of fermentation, may easily lead to renewed disturbances of

[1] Immermann, *"Fettsucht,"* in Ziemssen's *Handbuch der speciellen Pathologie und Therapie*, vol. VIII, pt. 2. Leipsic, 1876, p. 404.

[2] Leube, *"Beitrag zur Therapie der Magenkrankheiten," Zeitschrift für klinische Medizin*, VI, 3.

digestion, should be restricted as far as possible: furtner, in dyspepsia accompanying anæmia or chlorosis, a carefully selected and properly prepared diet, as rich as possible in albumen, should be chosen. On the other hand, in "atonic weakness of digestion," as well as in "nervous dyspepsia," a certain variety in the choice of foods is desirable. The diet proposed by Professor Ebstein[1] for the dietetic treatment of obesity is adapted only to the plethoric form. In anæmic corpulence, fatty degeneration of the heart, and disturbances of the circulation—though only in certain well marked individual cases, and by no means so generally as is at present fashionable—it is advisable to employ Professor Oertel's[2] method. Its aim is to counteract as completely as possible the functional derangements, on the one hand by greatly reducing the volume of liquids imbibed, and on the other hand by outdoor exercise in the form of mountain-climbing, for which the district of Tarasp-Schuls affords such varied facilities.

With regard to the special dietetic treatment of the various diseases, we refer the reader to the excellent and truly classical work by Dr. Pavy[3] on this subject.

III. The Indications for the Health-Resort of Tarasp-Schuls.

From the information afforded above regarding the physiological effect of the remedies found at Tarasp-Schuls, every physician could no doubt deduce for himself the indications for their therapeutical employment, but we nevertheless deem it

[1] Ebstein, *Die Fettleibigkeit (Corpulenz) und ihre Behandlung nach physiologischen Grundsätzen.* Third edition. Wiesbaden 1883.

[2] Oertel, *Handbuch der allgemeinen Therapie der Kreislaufsstörungen.* Ziemssen's, *Handbuch der allgemeinen Therapie,* vol. IV, Leipsic, 1884.

[3] F. W. Pavy, M. D., F.R.C.P. *A Treatise on Food and Dietetics, Physiologically and Therapeutically considered.* Second edition. J. and A. Churchill, London, 1875.

advisable to embody in this handbook a catalogue of the most important indications of our health-resort, as gathered from a practical experience extending over many years.

Of all the curative agents here, the most important, even with regard to indications, is certainly the *Alpine climate.* Where the climate of Tarasp-Schuls is contra-indicated, of course no trial can be made of its glauber-salt springs or chalybeate waters. As such an absolute contra-indication of our health-resort we must regard all cases of extreme debility, where the necessary vitality and power of resisting the effects of the Alpine climate are wanting.

On the other hand those cases are well adapted for treatment here in which the climate is coincident in its effect with one or other of the groups of springs, or exerts a favourable influence upon some especially prominent symptom of disease. Referring the reader to what has been said above regarding the effects of the climate (pp. 46 and 47), we will state at once that in the following classes of diseases experience shows the fortunate combination of the lofty situation of Tarasp-Schuls with the simultaneous use of one or other of the groups of springs, or of both combined, to be particularly efficacious:

(a) Nervous disturbances and so-called "nervosity", which in many diseases often appears as a prominent complication.

(b) Functional weakness of digestion and stases in the portal vein and abdominal organs.

(c) General anomalies of nutrition, especially chlorosis and anæmia; anæmic obesity, anæmic conditions after long sojourns in tropical countries or of persons debilitated by chronic malarial infection in marshy lowlands.

The combined employment of glauber-salt waters and chalybeate springs is very beneficial in many cases of fatty degeneration of the heart, of anæmic obesity, and in all cases where a too lowering operation of the glauber-salt springs is to be avoided; further in chlorosis complicated, as so frequently happens, with obstinate constipation, in dyspepsia of anæmic patients, &c.

This fortunate combination in Tarasp-Schuls of an Alpine climate, glauber-salt springs, and chalybeate springs, often permits of *entire families* going through the course of climatic or balneotherapeutic treatment suitable for the different members without the separation that must otherwise take place.

The combination of various remedies with a salubrious Alpine climate also renders Tarasp-Schuls well adapted:

(a) For *preparatory treatment* previous to the employment of the chalybeate springs of St. Moritz or to general climatic cures in the Upper Engadine.

(b) For *after-treatment,* as an Alpine health-resort with the simultaneous advantage of treatment with strengthening chalybeate waters after a course of almost any mineral water, or of a moderate employment of the glauber-salt springs in continuation of treatment at Carlsbad, Marienbad, Vichy, Kissingen, Homburg, &c.

I. INDICATIONS.

A. Diseases of the Chylopoetic Organs.

1. *Chronic catarrh of the stomach,* regarding the balneotherapeutic treatment of which Leube[1] has the following remarks: "It is acknowledged that evacuation by the intestine is best attained by the employment of alkalo-saline mineral waters, the glauber-salt contained in which is of great efficacy in producing this effect. Especially valuable are the springs of Carlsbad, Marienbad, and *Tarasp*, the latter being particularly useful in cases characterized by excessive flatulence, owing to the large amount of carbonates, especially carbonate of lime, contained in it. This *specific effect of the Tarasp springs* in such patients is explained by the assumption that owing to their richness in the above-named salts, where excessive fermentation with development of much gas and acid occurs the waters are able to neutralize the latter and *to remove*

[1] Leube, "*Magen und Darm,*" in Ziemssen's *Handbuch der speciellen Pathologie und Therapie,* vol. VII, pt. 2. Leipsic, 1876, p. 71.

from the body the thus altered or improved contents of the alimentary canal before new fermentation of any importance can take place. The employment of natural glauber-salt and soda springs is preferable to the prescription of simple glauber-salt, since the diseased mucous membrane of the stomach is thus affected at the same time by the other (soda) salts, whose salutary influence upon it is proved by thousandfold experience."

2. *Chronic gastric ulcer,* ulcus ventriculi simplex, can only under reservations be regarded as an indication for our health-resort. Leube[1] correctly remarks that, "owing to the large amount of free carbonic acid and chloride of sodium contained in the Tarasp spring, it seems to cause hæmorrhage more readily than the other mineral waters belonging to the same category." By warming the water and driving out its carbonic acid so far as possible this drawback may, however, be obviated.

3. *Gastralgia* is observed here chiefly as a symptom of gout or of chlorosis, and its treatment coincides with that of those diseases.

4. *Chronic intestinal catarrh,* enteritis chronica. "Just as in many cases of chronic catarrh of the stomach," says Leube[2], "a course of mineral waters most surely and permanently gives tone to the diseased mucous membrane of the stomach and restores it to its normal condition, so also is this the case in catarrh of the intestines. In general the alkaline springs have a beneficial effect here also, especially the alkalo-saline waters of *Tarasp,* Carlsbad, Rohitsch, &c., which are well known to be of sovereign effect against the stases in the portal region so often accompanying intestinal catarrh, against fatty liver, &c. In *chronic diarrhœa* the employment of small quantities of the glauber-salt waters, taken warm, or in very profuse discharges the Bonifacius water, so rich in lime, is efficacious. For the relief of the *nervousness* and

[1] Leube, l. c., p. 110.
[2] Leube, l. c., p. 277.

hypochondria often accompanying intestinal catarrh the Alpine climate is an important factor. Most frequently induced by chronic catarrh of the intestines, the symptomatic diseases of *habitual constipation, plethora abdominalis,* and *hæmorrhoids* are largely represented in Tarasp-Schuls, since our glauber-salt waters, so extremely rich in salts exciting lively peristalsis of the stomach and intestines (bicarbonate of soda, sodium chloride, and glauber-salt) produce excellent and enduring results; while in *hæmorrhoids in lean subjects* a discreet employment of the chalybeate springs, alone or combined with the alkalo-saline waters, and backed by the stimulating Alpine air, sufficiently promotes nutrition.

5. *Hyperæmia of the liver,* especially congestion produced by an injurious diet, by irritating ingesta, or by costiveness. Also in enlargement of the liver after intermittent fever, and in engorged hyperæmia complicating diseases of the heart or of the organs of respiration.

6. In *cirrhosis,* hepetitis interstitialis, arising from intemperance, but only in the first stages, the springs of Tarasp-Schuls are indicated.

7. *Fatty liver,* hepar adiposum, the balneotherapeutic treatment of which is identical with that of obesity.

8. *Catarrhal inflammation of the biliary ducts,* icterus catarrhalis, if of long standing and important modifications of the liver are threatening.

9. *Cholelithiasis.* In this malady our alkalo-saline springs, which combine the carbonate of soda of Vichy with an amount of glauber-salt almost equal to that in the Carlsbad waters, produce excellent results; frequently after two courses of treatment, and in some instances even after a single course, the non-recurrence of the disease for several years has been recorded.

10. *Chronic spleen-tumours* resulting from long-continued intermittent fever often decrease with astonishing rapidity under the combined influence of the glauber-salt and chalybeate springs, though the chief factor is here probably the simultaneous influence of the Alpine climate.

B. General Anomalies of Nutrition.

11. *Obesity* is a malady which furnishes from year to year an increasing contingent of patients at Tarasp-Schuls. Owing to the presence both of glauber-salt and chalybeate springs, both forms of this disease are successfully treated here, for, as Immermann[1] well remarks, "at Tarasp both varieties of medicinal springs are found, furnishing remedies for the two principal types of this malady, some of the springs being simple alkalo-saline waters, while others are classed as alkalo-saline chalybeate springs; the Lucius-Quelle is the chief representative of the former, the Bonifacius-Quelle of the latter group." Regarding the mode of operation of the first group of springs in plethoric obesity, compare what has been said above at page 57.

12. *Anæmia* can be successfully treated in Tarasp-Schuls, thanks to the fortunate combination of two efficacious remedies—mountain air and chalybeate waters.

13. In *chlorosis* a visit to the mountains and the external and internal employment of the chalybeate waters is advisable as *after-treatment.*

14. *Scrofula* has figured since ancient times as one of the indications of our health-resort. In scrofulous exudations of the glands the Lucius-Quelle is said to produce a good effect, which we are rather inclined, however, to attribute to the lofty situation of Tarasp-Schuls.

15. In *diabetes mellitus* Professor Dittrich[2] obtained satisfactory results with the Lucius-Quelle in the case of two patients treated in the hospital. Braun too says: "The properties of the springs are here reinforced by the particularly lofty elevation of the place and by its equable and mild climate, and for the latter reason we think it desirable to try the effect upon *diabetic* patients of a visit to Tarasp and the use of its springs."

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[1] Immermann, l. c., page 406.

[2] Dittrich, *Der Kurort Tarasp-Schuls im Unterengadin. Blätter für Heilwissenschaft,* II, Nr. 18, 1871.

C. Diseases of the Organs of Locomotion.

16. In *gout* Tarasp-Schuls affords various remedies for anomalies of digestion, and for venous stases, large deposits of fat, &c., as well as on the other hand for anæmia and debility, while the Alpine climate has an admirable effect in promoting nutrition and strengthening the system. Regarding the capacity of the springs for dissolving uric acid, compare the remarks at page 57.

17. *Chronic rheumatic inflammation of the joints,* and *chronic muscular rheumatism.*

D. Diseases of Women.

18. *Chronic metritis* and *endometritis,* in cases of long standing, and as after-treatment.

19. In *anomalies of menstruation,* as well as in *diseases of the climacteric period,* the glauber-salt springs are useful where anomalies of digestion, habitual constipation, obesity, or abdominal plethora are to be removed; in pronounced chlorosis and anæmia the chalybeate waters.

E. Diseases of the Nervous System.

Owing to the lofty situation of Tarasp-Schuls, the influence of the climate alone is generally effective. The employment of the springs is indicated:

20. In *general neuropathic dispositions, in neurasthenia* and *spinal irritation,* if anæmia prevails.

21. Among general nervous diseases, *hypochondria,* if the cause is intestinal catarrh (which see) requires the use of the glauber-salt waters, while on the other hand the anæmic form of this malady, and *hysteria,* are indications for the chalybeate springs.

22. In *neuralgia,* if due to abdominal plethora, anomalies of digestion, or gouty diathesis, the glauber-salt waters must be prescribed; but if, as is by far the most frequently the case, of anæmic origin, the chalybeate springs are indicated. Purely neuralgic forms of sciatica and face-ache con-

stitute a decided contra-indication for the employment of the alkalo-saline waters.

F. Diseases of the Organs of Respiration.

23. In *chronic catarrh of the mucous membrane of the respiratory organs* the alkalo-saline springs, so rich in soda and common salt, have always been regarded as valuable remedies; they are seconded by the favourable climatic situation of the health-resort. These springs prove specially effective in bronchial catarrh in well nourished, corpulent individuals accustomed to too high living, while in anæmia the chalybeate springs are prescribed.

24. In promoting the absorption of old *pleuritic exudations* a prolonged stay in Tarasp-Schuls, combined with a moderate use of the waters, is efficacious.

25. In *chronic emphysema of the lungs* the climatic advantages of Tarasp-Schuls are also of the first importance.

G. Diseases of the Urinary Organs.

26. In *chronic catarrh of the bladder* with profuse secretion of mucus the Bonifacius-Quelle, so similar in its composition to the Helenen-Quelle at Wildungen, has proved most valuable, and in simultaneous abdominal plethora our alkalo-saline springs.

27. Of the various forms of *nephrolithiasis* only that group can be treated in Tarasp-Schuls which includes the sand and gravel consisting of concretions of uric acid. But in this disorder our alkalo-saline springs are acknowledged to be highly efficacious and reliable, provided care be taken not to employ them in too large quantities and thus induce alkaline reaction. Regarding the capacity of our springs for dissolving uric acid, compare page 57.

28. *Chronic Bright's disease* is symptomatically relieved, if accompanied by anomalies of digestion, habitual costiveness, &c., by the glauber-salt waters, and if associated with anæmia by the chalybeate springs.

H. Diseases of the Heart.

29. The *hypertrophy of the heart* appearing in general plethora, and the lower degrees of *atheroma of the arteries*, demand the employment of the cold glauber-salt water after its carbonic acid has been as far as possible expelled by prolonged shaking, the addition of milk, &c.

30. *Fatty degeneration of the heart* is very successfully treated in Tarasp-Schuls, as has been remarked above (see page 46).

I. Diseases of the Organs of Sense.

31. The *ophthalmic diseases* capable of beneficial treatment by the internal employment of our alkalo-saline springs are:—chronic catarrhal inflammation of the conjunctiva, choroideitis chronica, and hyperæsthesia retinæ; also incipient glaucomatous processes.

32. Among the *diseases of the organs of hearing*, the subjective derangements due to plethora abdominalis, habitual constipation, &c., and making themselves perceived as singing in the ears, are indicated for treatment with our glauber-salt waters.

2. CONTRA-INDICATIONS.

Our experience leads us to regard the following as *climatic contra-indications for Tarasp-Schuls:*

1. A high degree of constitutional debility.

2. Strongly marked cachectical states, especially in carcinomatous degenerations of the stomach, liver, &c.

3. Serious valvular defects with incomplete or entirely disturbed compensation, advanced atheroma of the arteries with tendency to apoplexies, aneurisms, &c.

4. Chronic bronchial catarrh with considerable bronchiectasis or very advanced emphysema.

5. Disposition to relapses of polyarthritis rheumatica acuta.

6. Epilepsy and mental disorders with tendency to excitement.

IV. Routes of Access.

Tarasp-Schuls may now be most conveniently reached (compare the map on the cover):

1. From the *east* by the newly opened Arlberg Railway. There is direct express communication with Paris, Brussels, and Cologne, from the first-named city in a journey of about 20 hours by through trains with comfortable carriages to the last railway station, LANDECK. From here there are two diligences daily direct to Tarasp-Schuls and Kurhaus Tarasp, conveying the traveller in about 8 hours upwards along the River Inn, by the magnificent and highly-interesting Finstermünz Road, through Nauders and Martinsbruck, *without crossing a mountain pass.*

2. From the *south-east* the railway extends as far as MERAN, whence Tarasp-Schuls is reached in one day's journey, by way of Nauders, through the fertile Vintschgau, with its numerous old castles.

3. From the *south* the most convenient route is that from Como over the magnificent lake of the same name to Colico and Chiavenna, and thence by diligence in one day's journey across the low Maloja Pass and through the entire Upper Engadine, so celebrated for its beauties of scenery, and through the upper portion of the Lower Engadine to Tarasp-Schuls.

4. From the *north* to the railway station of LANDQUART (between Ragatz and Coire), and thence through the famous Alpine health-resort of Davos and over the lofty Flüela Pass, surrounded by glaciers, in a 13 hours' ride by diligence to Tarasp-Schuls. But for visitors arriving from the north Route No. 1, *via Landeck,* is the most convenient.

Explanation of the Coloured Diagram.

The figures indicate the parts of solid constituents, calculated as anhydrous bicarbonates, in 10,000 parts of mineral water.

The space between any two perpendicular lines corresponds to five-ten thousandths, except as regards protoxide of iron, the quantity of which is relatively so much smaller than that of the other constituents that it was found necessary to multiply it ten times, so that the space between perpendicular lines only represents one-fifty thousandth. The total amount of solid constituents contained in the different waters (including those not shown in the diagram) is noted to the left of the black stripe; the separate figures for the various constituents are omitted from the diagram, but will be found in the Table at page 51. To economize space the laxative salts (sulphates of soda and potash and bicarbonate of magnesia) have been united under one head.

The figures below the names of the various springs indicate their temperature in Fahrenheit degrees.

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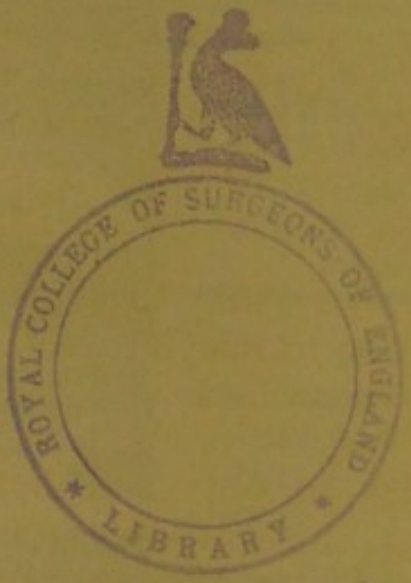
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Diagram showing the composition

the solid constituents (parts in 10,000 pa

(The black stripe with figures to the left of it shows the total solid cone

0 10 20 30 40 50

Tarasp
Lucius
44°

147.5

CO_2
Laxative salts.
$Na\,O\,2CO_2$
$Ca\,O\,2CO_2$
$Fe\,O\,2CO_2$
Na Cl.

Marienbad
Ferd. Brunnen
50.5°

102.4

CO_2
Laxative salts.
$Na\,O\,2CO_2$
$Ca\,O\,2CO_2$
$Fe\,O\,2CO_2$
Na Cl.

Franzensbad
Salzquelle
51.8°

54.0

CO_2
Laxative salts.
$Na\,O\,2CO_2$
$Ca\,O\,2CO_2$
$Fe\,O\,2CO_2$
Na Cl.

Karlsbad
Sprudel
162.5°

62.9

CO_2
Laxative salts.
$Na\,O\,2CO_2$
$Ca\,O\,2CO_2$
$Fe\,O\,2CO_2$
Na Cl.

Elster
Salzquelle
47.3°

83.0

CO_2
Laxative salts.
$Na\,O\,2CO_2$
$Ca\,O\,2CO_2$
$Fe\,O\,2CO_2$
Na Cl.

Kissingen
Racoczy
51.2°

90.5

CO_2
Laxative salts.
$Ca\,O\,2CO_2$
$Fe\,O\,2CO_2$
Na Cl.

Vichy
Grande Grille
110.5°

70.0

CO_2
Laxative salts.
$Na\,O\,2CO_2$
$Ca\,O\,2CO_2$
$Fe\,O\,2CO_2$
Na Cl.

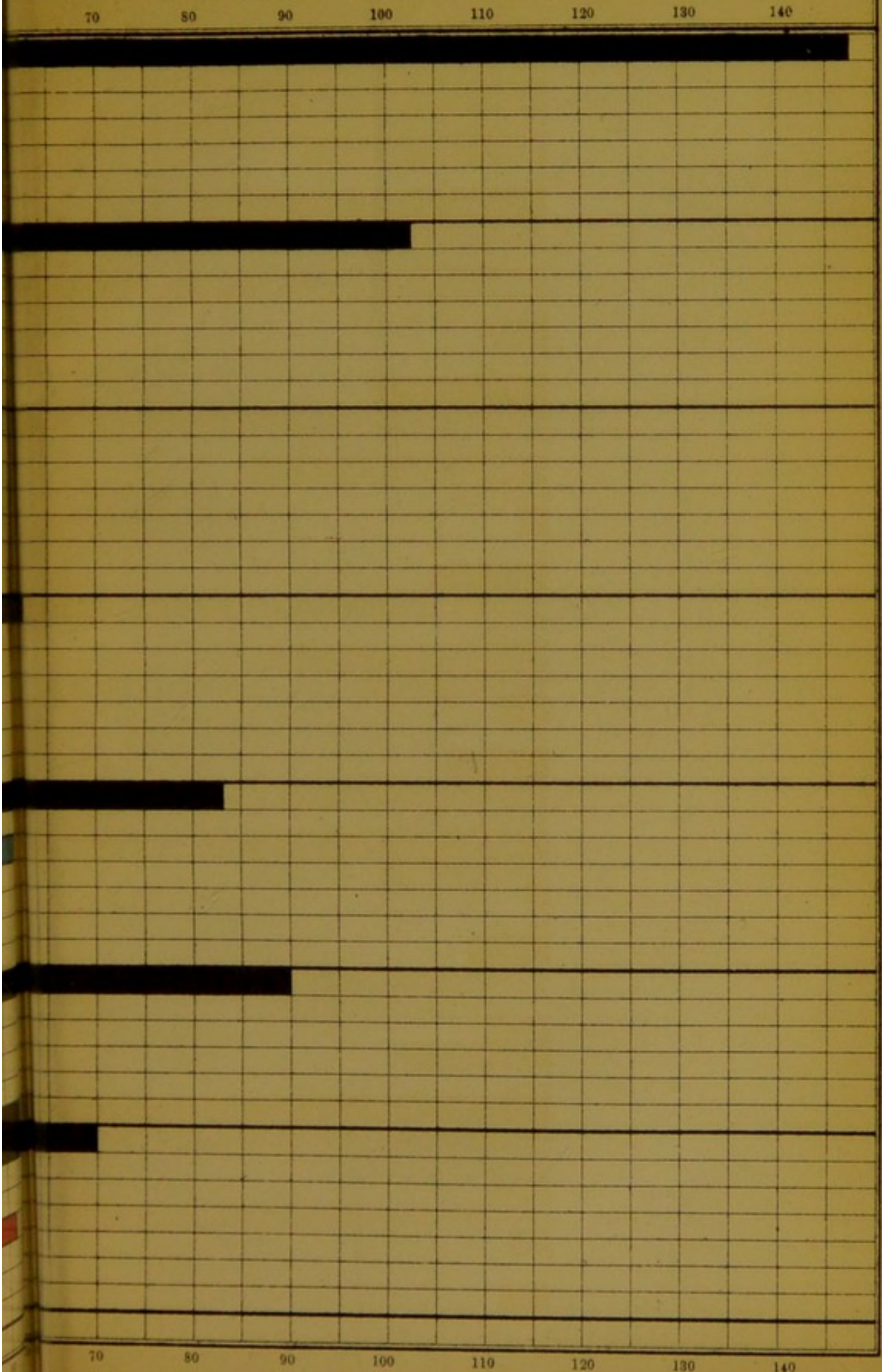
Killias del

0 10 20 30 40 50

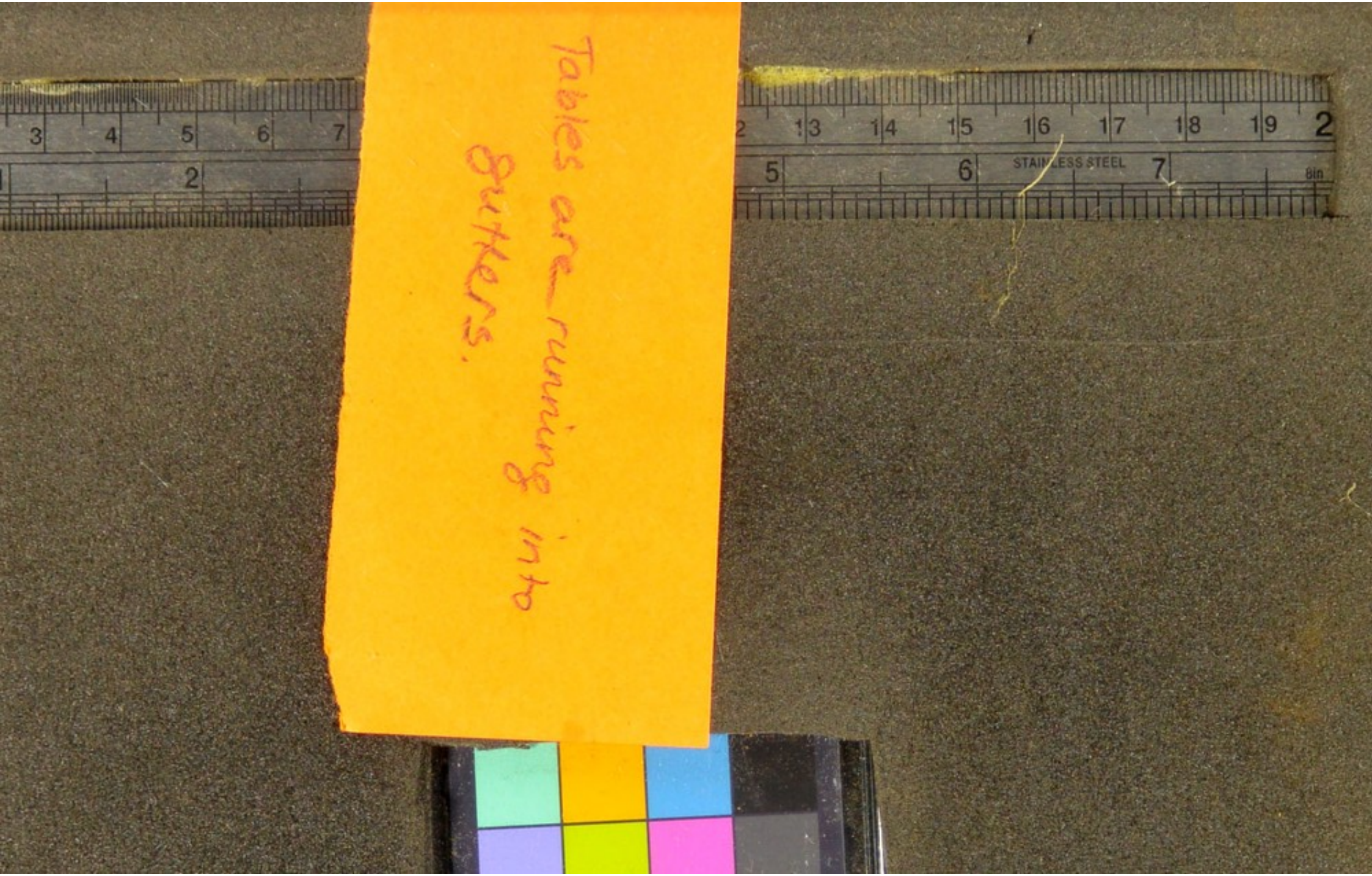
various Alkalo-Saline Springs,

alculated as anhydrous bicarbonates.

The other colours always represent the same chemical formulæ.)




ROYAL COLLEGE OF SURGEONS OF ENGLAND
LIBRARY


Tables are running into
gutters.