of Sievers, called Old Red by Liddle and Giron by Schleich, that is with the same formation which Dreher supposes to be the mhimf salt formation in the central part of the E Cordillera. Unhappily, the relation with the Upper Carboniferous could not be established; the underlying formation is metamorphic and may contain porphyroides.

According to the features, we previously consider the Soapaga an equivalent of the Lagunillas, of? Permo-Triassic age. If this is so, it should be considered a salt suspective formation. According to Schleich, its Venezuelian equivalents may have some salt. In Colombia no indications of this kind are known from the Soapaga. Notwithstanding, it may contain salt if present, as probable, in the subsurface of the saline region of the E Cordillera. In this case some indication should be found in the impervious "hat" of the salt plugs of the Bogotá region, called rute, formed by the dissolution of the top of the plug and by the consequent accumulation of the débris which the salt brought to the surface. The rute does not contain red pieces at all; the material is clearly Villeta and perhaps Giron (indicated by emeralds).

The other red formation, the Pipiral, is considerably metamorphic and shows no salt indications. - The Quetame does not offer salt expectations.

The writer therefore believes with R. Scheibe, R. Lleras Codazzi a.o. that the salt belongs to the lower cretaceous, especially to the Giron and possibly to the Villeta. The Guadalupe cannot be considered a salt formation becuase the plugs (of Bogotá) appear in the lowermost Guadalupe or the uppermost Villeta, having pierced a great thickness of older Villeta and even Giron, as shown by the rute.

The question about the age of this salt can be elucidated by a special study along the tectonic line (W flank of the Servitá syncline of O. Renz) which runs from the region W of Villavicencio to Medina and to Campo Hermoso in Boyacá. The writer made a rapid inspection to the Upin salt mass, which is the S salt indication of the mentioned line. The salt is not covered by rute so that it is rather probable, for this reason, that it lies in situ in the lower Giron, where it appears. The platy shale level, in which it is bedded, is the typic sediment of the Tablon section and this Tablon level bears the only important gypsum layers

known until now in Colombia, those of the Macanal-Miraflores region in S Boyacá, situated in the center of the salt region.-N of Upin, along the tectonic line mentioned above, the outcrops arem to be frecuent and should be situated in the Giron which follows that line. One outcrop is known from the village of Medina, others are reported NNE and SW of this village.-We advise that these outcrops of salt are situated close to the steep carboniferous&Pipiral wall of the edge of the Quetame massiv, so that many viewspoint can be studied.

The Villeta has no known salt outcrops; the Gargasian level has much gypsum plates, and the sandy limestones below have a reddish colour. A regression of the sea follows to the Gargassian and probably to the Albian, illustrated by the fresh water formation of the Une sandstone which the writer considers now cenomanian(diefly), because it is underlain in the department of Huila by limestones with Schloenbachia(Oxytropidoceras).

Finally we refer to the tectonic position of the salt plugs of the Bogotá region. They all are situated on the flanks or on the plunges of domes(Zipaquirá, Nemocon, Sesquilé, Suesca, Tabio, El Salitre abt 15 kms SSE of Sopó and La Calera).-As mentioned, the Upin layer and probably the other salt outcrops along the Villavicencio-Campo Hermoso line, which are considered in situ, are on the W flanc of the Servitá syncline.-Generally, the salt masses lie around the N portion of the huge Quetame dome(land mass) and at its prolongation to the N. Only a few poor salt springs, some of them tertiary(Chaguaní) are found away from that dome.

The Hague, August 13., 1937

H. Hubach

As to the ~~Permian~~ age of the Colombian salt layers, situated near Bogotá, the writer disagrees with Dreher. From general viewspoints one can say that the large Permian salt deposits are situated N of the old Thetis, in N America, in Europe and the Ural. So far as the writer knows no important permian salt formations are known S of that ~~transversal sea~~ latitudinal sea, towards the Aequator.

The error of interpretation may consist in the parallelisation of Hettners Giron at the type locality ~~of Giron~~ with the venezuelian Giron of Schleich. ~~The series of~~ Dreher takes as ~~base for correlation~~ type ~~profile~~ column of the Giron that of Werenfels. This Giron has volcanic matters at the base and it is known that the "cretaceous" Giron is volcanic in the upper Magdalena valley and even at the W foot of the E Cordillera (Natagiama-Dolores, erroneously considered Guaduas by Stille). According to Sievers and Bergt, the volcanic facies ~~goes~~ is also present at the ~~E~~ foot of Cesar valley which is the continuation of the Magdalena valley. At the upper part of the Cesar valley, Karsten found in the red Giron the Crioceras Duvali Lév. var. undulata Karst, which also occurs in the black Giron at Cáqueza, E of Bogotá. W. Kehrer advises that the red Giron is characteristic to the Santander land mass; it is so only on the W side and on the serrania de Ocaña-Perijá. He considers that Hettners Giron at the type locality can only be fixed by means of determinatin of the Limestone which

2) The salt plugs of the E Cordillera are situated in the cretaceous which surrounds the N part of the Quetame massiv (mesozoic development dome). The Salina of the Casanare, the northernmost salt indication, is a hot saltwater spring. The Magdalena salt indications (Ritter) are small salt water springs of the tertiary (San Martin, San Francisco horizon) & partially perhaps saltwater of the petroliferous upper cretaceous.

The salt plugs of the Sabana de Bogotá are all situated towards the plunge and on the flanks (Tabio) of domes.

They all appear in the cretaceous (Nemocón, Zipaquirá, Tabio, Sesquilé, El Salitre and La Calera at the border of Villeta & Guadalupe; Upín in the Girón and the Medina plug probably, too). The largely exposed Pipiral has no known salt indications; it is more or less phyllitic. The Soapaga and the Lagunillas and the venezuelian Girón have no salt plugs. The "[illegible]" deposited at the top of the Bogotá salt plugs has no red materials. The Upín salt layer probably lies in situ in the Girón; the same as that of Medina, near the Pipiral formation. Evidently in the same horizon occurs the important gypsum layers of Macanal, on the Garagoa river.

For these reasons, the writer believes that the salt plugs of Cundinamarca & Boyacá are cretaceous, having been deposited in the Girón & possibly in the Villeta time.

The question may be cleared by the explorations from Upín to Medina, Mámbita, El Cruzero which intends Dr Trumpy during the next dry season.

Gulf Coast

Age / Coahuila	S. & C. Coahuila	Quitman Mts.	Malone Mts.	N Louisiana Pine Island Caddo	Arkansas	Arkansas Smackover	Tampico	Puebla Veracruz Mecapalapa	Tehuacan	Tonalapa	Mogoñe	SE Chiapas W Guatem.	Chiapas Guatemala
Low. Washita Fredericksb.				Washita = Fredericksb.: • sh, gumbo	Washita grey marl, & lst / Fredericksb. s. lst.	Gulf series			Cretaceous				
Paluxy		Tuffs, lava, lst. • beds. [?]		[illegible]	• red & yellow weath. sd & cl. ~ Paluxy								
Alb.-Garg. / [?] Barrême	Sh, lst. (× +) / Cuchillo 600-700 m	marl/lst. / Massive lst. / Ca. cl. with nod. cl. lst.		Upp. Glen Rose lst. / × × / Low. Glen Rose lst. with Douvilleiceras	Queen lst × / Holly Creek • red, yell. cl; sd, grv. / Dierks lst. cryst. lst, green sh.	Low. Glen Rose grey lst & sh, towards base • beds		Tamaulipas lst.					
Neocomian (pre-barremian)	Las Vigas 600 m Sh & sst / ca-sst.	Las Vigas sh & lst. • sst, • s.sh. grey sst [?]	Valang. lst, cgl, sst:	• red beds ±700 m [?] / Basal Trinity sd. • & white sd	gr., yellow sd, cl / Pike gravels	• mudst, ca-nod., sst, chert cgl. / [?] • & grey cl; sd. sst, fe-nod., • cl l.sst; • mudst & sst / Werner × × Smackover lst.		Cenoman to Neocom.		Chinameca lst.		Todos Santos Neocom. to upp. Jur.	Todos Santos
Jurassic (Rhaet. low. Mid. | upp.)	[?] Plomosa 350 m lst, qtzt., cgl, sh.		Upp. Jur. cgl., lst.			+ + + [?] • sh. × cgl	Kimer. / [?] • beds	Pimienta lst. chert / Taman sl. lst, chert. / • beds marls, sst, sh, cgl / Schists, sl. lst. sst = S. Bartolo	+, × Oxford of Oaxaca & × m. Jur. of Huamuxt. / Bajoc. to • Lias: br. & yellow marl with × •	Valang. to Kimer. / +, ×, • [?] sh; cgl & sst. Pre-Kimer. [?]	Jurassic	× • Marine upp. Jur. / Continent. middle & lower Jurassic	
Trias							[?] • [illegible]		C. sst. •, • sh. Rhetic [?]	• [illegible]	• beds [?]		
Permian	[?] [illegible] (? Paleozoic)		× Permian ××, lst.									Permian dark sh.	Foss. lst / Sta Rosa (• sst; sl), grw., lst. ×, + H_2O m-Lower Permian (Schuchert)

[?] doubtfull age. The doubtfull Neocomian may be Frecuently Permo-triassic, acc. to Dreher.
+ salt
× Gypsum, ⨯ Anhydrite
• red sediments

Remarks on Dr Dreher
opinion about the age of the Col. salt.

1) The writer does not know the type locality of the Girón, W of Bucaramanga.
It is possible that the Girón of Hettner is older than the Girón of the writer, established as the lowermost cretaceous which lies below the Villeta, considered by Hettner as the limestone group of the cretaceous. (The division line between Girón and Villeta was chosen because of the constance of the Caqueza or Apicabur sst.)
Chiefly because of porphyritic material
The Girón is frequently reddish & violaceous in the upper Magdalena valley & also in the valley of the Cesar; but towards the E Cordillera, f.e. at Girón, it may follow the reddish precretaceous formations of Venezuela & Colombia.
The younger reddish formation of them is represented by the La Gé[illegible] of Sievers, probably identical with the Girón of Schleich, which lies below the Tambor and above the upper Carbonif. form.
Its possible equivalents were found in the E Cordillera at the Guantiva massive, W & N of the town of Sogamoso. This Soapaga formation is conglomeratic (with marble pebbles), sandy & clayey. No fossils were found. The carbonif. formations were not yet identified in the Guantiva region; the Soapaga lies on Quetame like rocks (? cambro-silurian).
The older red formation is the devonian of Venezuela, the possible equivalents of which occur E of Bogotá, at the E flank of the Quetame massive. It was called Pipiral and is composed of red, yellow & dark cl. sh., sandstones and of two fine-grained quartz congl. beds at the base. This Pipiral is older than the upper Carbonif.; it may be devonian. No fossils were found. The Soapaga is not present at the Quetame massive. It seems rather improbable that the Pipiral represents a facies of the Soapaga, chiefly because of the different kinds of the conglom.

~~Because~~ Due to the varying cond. of transgr., thickness & facies, at the different salt domes the correl. interpretation of the salt formations older than the Glen Rose–Buckhill(?) & than upper Jurassic (Mexican) is complicated. This & the fact that the main salt layers of E Texas, Germany and Russia are Permian, makes it obligatory to consider the Permian age of those salt regions.

Magdalena(?) 5	4	3	1	2	6	7	8
	Tehuacan SE Mexico	Tonalapa Salt Domes Cerro Pelon	Tampico	Puebla Veracruz Mecapalapa	SE Chiapas W Guatemala	S Guatemala W Honduras NW S. Salvador	Chiapas Guatemala

				Tamaulipas lst. Neok. ten.	Cretaceous limest	Cretaceous limest	
Cretaceous	Chinameca lst.	Valang. to Kimmer.		Pimienta beds Portlance Taman Kimmeridge slates, lst.	Todos Santos Red Gyps. Red sst, viol & red marl, sh, cgl. [illegible] Jurassic to upper	Metapan beds Marls, sst, sh, pud. st, cgl.	Todos Santos
Gypsum bearing Oxford Oaxaca Huamuxtitlan m. Guerr. w. gyps. Bajocian schist Br. yellow marl with gyps.	Cgl. sst. & salty gyps. sh. serpen. Varieg. red Pre-Kimmeridge	Kimmeridge Red beds		lst, chert Red bed ser. & salty gyps. San Bartolo schists, slates, lst, sst Lias	Conformable upper lower Triassic	[illegible] plants	[illegible]
Rhetic: Cgr g-sst green & red. Nochixtlan red, green sh. ? Retic.						Triass. plants	
					Permian dark sh.		Perm: foss. lst.
							Carbon.: sl. grw., & lst, red & br sst, Gypsum, salt water.

Red beds ? red beds

Red beds of Tamaulipas - Tampico - Puebla - Veracruz may be middle Jurassic

p. 31 "There exists then a series of Red Beds ... into the Lower? It goes into frequent in the Neocomian of the Gulf coast and even in the [illegible]; red beds are also Oxford gyp and in Peru

Rec. Schuchert [illegible] Perm.