SELECT

ESSAYS

ON

COMMERCE, AGRICULTURE, | MINES, FISHERIES,

AND OTHER

USEFUL SUBJECTS.

Felix, qui potuit rerum cognoſcere cauſas.

VIRG.

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THE

PREFACE.

THE following Eſſays are tranſlated from a periodical work, publiſhed at Paris, under the title of *Journal OEconomique*; the tranſlation being undertaken at the deſire of ſeveral perſons of taſte and diſtinction, who thought it might conduce to the improvement of uſeful knowledge, and were at pains to ſelect the papers that were beſt adapted for this purpoſe.

IN our Collection, therefore, we flatter ourſelves, that the reader will find ſome curious diſquiſitions on the nature of commerce and manufactures; many ſolid reflexions and ſagacious obſervations upon agricul-

ture; a number of conſequential hints and important diſcoveries in the inveſtigation of mechanicks and natural philoſophy, and ſeveral entertaining and authentic accounts of countries and nations, which are but little known to the generality of mankind.

As the original fund, far from being exhauſted, is ſtill increaſing by the contributions of the learned and judicious, we ſhall, in all probability, extract from it, matter ſufficient to compoſe another volume, provided this meets with that encouragement which, we hope, it will be found to deſerve.

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MEMORIAL

Concerning the

COMMERCE OF RUSSIA.

ALTHOUGH Ruſſia hath, in time, extended itſelf into Siberia, the Kingdoms of Aſtracan and Caſan, the Ukraine (in which it hath built cities) Livonia, and Finland; it was antiently compoſed only of four governments, namely, Novogorod, Archangel, Niſogorod, and Moſkow, which laſt was the moſt fertile, and the beſt inhabited. The Ruſſians at that time carried on no commerce, but what was altogether indiſpenſible: in other reſpects, they lived almoſt in a ſtate of nature, juſt as ſeveral Tartar nations live at this day.

Towards the end of the ninth century, a Vandal called Rurik, who exerciſed piracy on the Baltick, ſailed up the river Neva, entered the lake of Ladoga, and penetrated as far as Oſtagard, now called Novogorod, which the Ruſſians had already built. He eaſily underſtood the language of the country; for the Ruſſian tongue, as well

as thoſe of the Vandals, Poles and Bohemians, are ſimple dialects of the Sclavonian, which is common to all. Rurik being ſettled at Oſtogard, his experience, riches and power rendered him ſo conſiderable, that he ſoon became ſovereign of all the country, except the city of Pleſkou, which preſerved its liberty a long time, although Rurik was bent upon confining it within very narrow bounds.

Rurik, according to the hiſtory of Ruſſia, and the annals of Pleſkou, was a native of Stargorod in the Varagen, that is, of Oldemburg in Vagria; a circumſtance which induced him to give to the place of his reſidence the name of Novogorod, which ſignifies New-Caſtle. His arms, which were a bullock's head, became the arms of Ruſſia, and the money was coined with that ſtamp; ſome pieces of which are ſtill to be ſeen in the collection of coins at Moſcow. This new prince concluded an alliance with the Danes, eſtabliſhed a commerce with the city of Lubeck, and drew into his kingdom a great number of his countrymen. Rurik was ſucceeded by his ſon Igor, whoſe wife Olga embracing the Chriſtian religion, received at baptiſm the name of Helen. This princeſs, after the death of her huſband, long and wiſely governed the kingdom of Ruſſia, during the minority of her ſon Soctoſclo, who dying, left two legitimate children, and a natural ſon called Volodimar, whom he had by a young woman who was in the ſervice of the Queen his mother.

mother. The dominions were divided among theſe three princes; but Volodimar having ſlain his two brothers, became ſole ſovereign of all Ruſſia. He put an end to the continual war which the Ruſſians had carried on againſt the Greeks, by a peace which he concluded with the Emperor of the eaſt, whoſe daughter he married. This princeſs introduced into Ruſſia the Greek religion and manner of writing; and this ſeems to be the epocha to which we ought to refer the title of Czar, which the ſovereigns of Ruſſia have aſſumed even to theſe times; for Czar is viſibly an abridgment of Cæſar; and every body knows that the name of Cæſar, which among the Romans was the deſignation of the preſumptive heir to the empire, became at length, among the Greeks, a ſimple title of honour. We may therefore preſume, that the Greek emperor, in beſtowing his daughter on the king of Ruſſia, conferred upon him that honourable title, in order to attach him the more ſtrongly to his intereſts.

Voladimar had ſeveral children, among whom he, before his death, divided his dominions. Of theſe princes ſprung ſome Ruſſian kings, whoſe families ſubſiſt at this day: but this diviſion of the ſtate, and ſtill more the diſcord that reigned among the brothers, weakened Ruſſia to ſuch a degree, that it could not reſiſt the enterprizes of its neighbours, and ſoon fell under the dominion of the Tartars, to whom it was tributary during

the twelfth, thirteenth, aud fourteenth centuries; in which laſt, the Ruſſians began to have princes who diſtinguiſhed themſelves by the ſucceſs of their arms; ſuch was Demetri Donſki, ſo called from the victories he had obtained over the Don. He it was who ſurrounded with walls the city of Moſcow, built thirty years before by prince Iran Daniloritz.

At length, in the beginning of the fifteenth century, divers provinces were re-united anew under the prince of Moſcovy, Baſilius Baſiloritz, ſirnamed the Blind; whoſe ſon John Baſiloritz repelled the Tartars, and ſeems to have had a number of Europeans in his ſervice; for in the year 1591 he ordered two ſtrangers, called John and Victor, to ſet out on the twenty-fifth day of March for Peſora, in order to diſcover ſilver mines.

Several other ſtrangers were called to Moſcou, under his ſon Baſilius Iranoritz, who even demanded people from the emperor of Germany, by a ſolemn embaſſy which he ſent for that purpoſe; but, although the emperor complied with all that he deſired, the nations that border upon Moſcovy oppoſed the paſſage of the Germans, ſcarce the fourth part of whom, with great difficulty, penetrated as far as Ruſſia. At that time, the Ruſſians carried on a pretty conſiderable commerce with Conſtantinople, and other cities of Greece, as well as with Poland and Hungary; and

and that which they had a long time maintained with Livonia and the city of Lubec, had continually increaſed. The cities of Novogorod and Pleſkou were thoſe which enjoyed the beſt part of it; the firſt eſpecially was become ſo rich, that the Ruſſians would ſay by way of proverb, *Who can pretend to contradict God and Novogorod?* Nevertheleſs, foreign merchants were not yet ſettled in Ruſſia; commerce being carried on in the fairs, to which ſtrangers repairing, exchanged the commodities which they brought thither for the merchandize of the country; and from hence, doubtleſs, proceeds the cuſtom conſtantly obſerved in all the cities of Ruſſia, where continual markets are held in the ſhops aſſembled in the ſame diſtrict, none of the inhabitants having their goods in their own houſes. Such was the firſt age of Ruſſia.

We begin the ſecond age of its hiſtory and commerce with the reign of Iran-Baſiloritz II. who being aſſiſted by the ſtrangers whom he engaged in his ſervice, conquered the kingdoms of Caſan and Aſtracan. He ſupported the robber Termack-Thimaſervitz, a Coſſack, in making himſelf maſter of all the provinces of Siberia; he made war with the Swedes and Poles; he ſupported duke Magnus, a Daniſh prince, who wanted to make himſelf king of Livonia, and gave him in marriage his brother's daughter: But he had no reaſon to congratulate himſelf, either upon the friendſhip he had ſhewn to Mag-

 nus,

nus, or the alliance he had contracted with him. The Daniſh prince engaged him in a war againſt Poland, with which he maintained ſecret intelligence, and by this perfidy, turned all the events of the war to the diſadvantage of the Czar his uncle, notwithſtanding all the remonſtrances which Denmark could make to him on ſuch unworthy conduct: for, in ſo doing, he not only failed in point of duty, honour and gratitude, but likewiſe ſenſibly hurt the ſincere union, which, ſince the reign of Rurik, had conſtantly ſubſiſted between the two courts, as it ſtill ſubſiſts, without being altered or impaired by time. To this union Ruſſia hath, for a long time, owed the great number of ſtrangers who have ſettled in her dominions: thoſe who were not Danes having found it impoſſible to go thither any other way than by Denmark, becauſe Sweden and Poland would not ſuffer them to paſs through their territories.

Under the reign of the ſame Czar, the Engliſh made themſelves known in Ruſſia: having undertaken to diſcover a paſſage to China, by the north of Europe, they entered the White ſea, and landed near the monaſtery of Archangel: from thence they penetrated as far as Kolmogorod, ſixty verſts from Archangel, that is, about fourteen leagues; for a common league of France conſiſts of four verſts and a half: there halting, they ſent deputies to the Czar, to demand liberty for trading and exerciſing their religion. Their requeſt was

was complied with, and they ſettled at Kolmogorod. But, in the ſequel, they moved nearer the ſea, and built, near the monaſtery, a town which took its name, and is at this day called Archangel. They were ſoon joined by the Dutch, and others, who built a church. In progreſs of time, all theſe people undertook to penetrate into the country, and once a year carried their commodities as far as the ſuburbs of Moſcow, where the ſtrangers in the Czar's ſervice had already obtained an evangelical church. In a little time, their deſires were not limited by the trade of the north-eaſt parts of Ruſſia; they thought of extending it on the ſide of Novogorod, and in order to accompliſh their aim, artfully profited by the favourable opportunities preſented by the wars, which from time to time broke out between Ruſſia and Sweden. The navigation of Archangel having opened to the European nations a new and more eaſy entrance into Ruſſia, Iran-Baſiloritz ſaw ſeveral Scottiſh families arrive in his dominions, in queſt of ſettlement and ſervice: of this number were thoſe of Skamber, Monpelon, Bruce and Kroo. The family of Bruce was raiſed to the dignity of count, and there is ſtill in Ruſſia a general of that name, who in the year 1746 married the princeſs Dolgoruki, formerly betrothed to the Czar Peter II.

After the death of Iran Baſiloritz and that of his ſon, the falſe Demetrius, who took poſſeſſion

of the throne, occaſioned great troubles through all Ruſſia, and few ſtrangers ſettled in it during that ſtormy period: but they went thither in ſuch numbers, as ſoon as the family of Romanou attained the ſovereignty, that the Czar Alexis, obliged by the revolt of his ſon Peter and the Strelitzes, to retire from Moſcow to Troize, having aſſembled the Ruſſians and ſtrangers who followed him, found among theſe laſt thirteen generals, thirty-ſix colonels, and a number of officers of inferior rank.

Accordingly, trade proſpered more and more, and was then extremely advantageous to ſtrangers. The ſcarcity of money in Ruſſia, kept every thing at the loweſt price; and the duties of the prince upon merchandize were very moderate: red wine paid no entrance, becauſe it was uſed in the churches; other commodities were rated at five per cent. in rix-dollars, (the rix-dollar being valued at fifty kopecs, and each kopec at one ſol of France) and the merchants were allowed to export from Ruſſia, without cuſtom, commodities to the value of what they had imported; and if they exceeded, all the ſurplus payed at the rate of five per cent. In a word, there was no tariff or reſtriction. Such was the ſtate of trade in that country, from the beginning of that at Archangel, to the reign of Peter the Great, a period at which commences the third age of Ruſſia.

The

The Czar Peter I. endowed by nature with the greateſt qualities, aſcended the throne in his infancy, under the tuition of his mother Natalia-Kirilonna-Nariſkin, and the direction of his governor old Galiczin, a Ruſſian nobleman of uncommon learning, who ſpoke the Latin language with facility, and by his ſervices had merited the rank of general. The queen-regent and this governor, who were equally poſſeſſed of good ſenſe and virtue, and at the ſame time perfectly attached to the young prince, happened likewiſe to concur in the ſame deſign, of forming the manners of the Ruſſian nation on thoſe of foreigners. The repeated attempts which they made in the execution of this ſcheme, brought upon Galiczin great perſecutions from the Ruſſians, who were obſtinately wedded to their own barbarity: but, notwithſtanding this oppoſition, that great man never loſt ſight of the point he had in view, and knew ſo well how to profit by the good diſpoſition of the young Czar, and the profound reſpect he had for his mother, that this prince, inſpired with the ſame ſentiments, executed in the ſequel, with aſtoniſhing ſucceſs, that which the Czarina and Galliczin had at firſt attempted in vain.

They had engaged in his ſervice a ſtranger called Le Fort, a native of Geneva, but educated in Denmark. This man having acquired the friendſhip of the prince, inceſſantly repreſented

to

to him the ſituation of other European countries: he diſcourſed with him in particular of Denmark, Sweden, and Holland; and took pains to make him acquainted with ſeveral ſtrangers who were in his ſervice, and of whom he might learn a great number of curious circumſtances. And, indeed, it is in ſuch particular converſations with men of ordinary rank, who are more frank and ſincere than courtiers, that princes and their miniſters, when they are great enough to make ſuch ſeaſonable condeſcenſions, are informed of many things which they cannot poſſibly know by any other means. There they diſcover the good and bad effects of their adminiſtration, and furniſh themſelves with an ample fund for reflection, from which, in the ſequel, the ſtate will certainly reap moſt excellent fruit.

A certain incident happened, to ſupport and confirm all that Le Fort had done to inſpire Peter with a taſte for the maxims and policy of the European nations: the Strelitzes, who formerly compoſed the body-guards, having in their firſt riſing conſpired the death of their ſovereign, and the princeſs his mother, the foreign officers, who diſcovered this perfidious plot, gave notice of it to the Czarina and Czar, time enough for the ſecurity of their perſons. Such an eſſential ſervice, imprinted on Peter's heart the warmeſt affection for ſtrangers, and the moſt perfect confidence in their fidelity. While he reſided at Moſcow, he took pleaſure in being in that quarter which is called

called the German Suburbs, where the ſtrangers in his ſervice, and the merchants who came annually from Archangel, had their abode: he lived in familiarity with them, and even made two journeys to Archangel, on purpoſe to ſail upon the ſea; and in theſe little excurſions it was that he learned what little of the Dutch language he underſtood.

The more lights this prince acquired by the converſation of ſtrangers, he grew the more deſirous of increaſing that knowledge; and in order to obtain full ſatisfaction, and inform himſelf by his own eyes, chiefly with regard to ſhipping and commerce, he reſolved to be in perſon one of that famous embaſſy which he ſent to Holland in the year 1697. There he learned the art of ſhip-building, and engaged ſeveral perſons, whom he ſent to Ruſſia, among whom was a Norwegian called Krens, whoſe family ſtill ſubſiſts at Peterſburgh. This Krens was the firſt admiral of Ruſſia, when Peter, at his return in the year 1698, ordered a fleet to be built upon the Don, near the mouth of that river.

In the courſe of the war with Sweden, which began about this time, the Czar having made himſelf maſter of Fleyſſiburg and Nye Skande, and ſecured the poſſeſſion of them by the victory of Pultowa, he founded and built St. Peterſburg, whither he deſigned to attract, not only the commerce which Sweden carried on in theſe quarters, but

but alſo that of all Ruſſia, which till that time was eſtabliſhed at Archangel. In effect, the communication between this new city and Europe, by the Baltick, was much more free than that of Archangel by the Frozen ſea, which is only navigable three months in the year, and where the navigation is always long and dangerous: he therefore invited ſtrangers from all parts to come and ſettle in this place, with the promiſe of conſiderable recompences, and the grant of great privileges.

We ſhould never have done, were we to enter into a minute detail of all that Peter the Great, and his ſucceſſors, particularly the Czarina Ann, have done to favour and increaſe the trade of Europe in Ruſſia. They have publiſhed ſeveral ſtatutes and laws, and made very uſeful ſettlements and diſpoſitions for regulating commerce in general. They have, moreover, formed a juriſprudence, or body of law for ſtrangers, and made new regulations for the cuſtom by ſea and land, with a new tarif of duties upon the commodities imported or exported. The ports formerly eſtabliſhed for the communication of the interior parts of Ruſſia, have been brought to perfection; poſt-horſes regulated, the roads made practicable, and the way ſhortened, by means of canals which they have ordered to be dug. So that the country is opened, and the different people who inhabit it have free communication one with the other: but, at the ſame time, the price of commodities

commodities has been ſeveral times doubled, becauſe the foreign merchants, finding a greater number of commodities for the exchange, have bought up a greater quantity of the Ruſſian merchandize, which is of conſequence become more ſcarce; and on the other hand, money is grown much more common than it was in former times.

We may therefore conclude, there is a good number of ſtrangers in Ruſſia, amounting ſome years to between nine and ten thouſand; being Finlanders, Germans, Swedes, Danes, Engliſh, Dutch, Poles, French, Italians, Armenians, Perſians and others. Each nation celebrates divine ſervice according to its own cuſtoms. Thoſe of the Roman catholic religion have a church at St. Peterſburg, one at Moſcow, and one at Aſtracan, the prieſts of which are alſo employed as miſſionaries at Ghilan in Perſia.

The eſtabliſhment of the European arts and ſciences in Ruſſia, by means of commerce, was the aim propoſed by thoſe ſovereigns who invited ſtrangers to people their dominions. Nevertheleſs, Peter the Great, ſo long as he lived, was extremely attentive in preſerving his people from that luxury, which might have been introduced by foreign modes and languages. With this view, he never employed ſtrangers without certain precautions: he never ſpoke in any other than his native language, except when neceſſity obliged him to uſe the Dutch, in order to make himſelf under-

underſtood; and he affected a particular contempt for the ceremony, magnificence and taſte of other European nations, propoſing to adopt all that was good and uſeful in them, and to reject what was uſeleſs and dangerous.

The pains which this prince took to draw into his country the commerce of Europe, did not make him neglect the means of improving the trade of Aſia: he endeavoured to wreſt the fortreſs of Aſoph from the hands of the Turks, that he might have a free trade upon the Don and the Black ſea, of which the ſea of Aſoph is a gulph. He ſent a Dane called Iſbrand, through Siberia into China, with the emperor of which he concluded a treaty, by virtue whereof the Czar had the liberty of ſending a caravan to Pekin every three years. On the other ſide, two Daniſh captains in his navy, called Biering and Spangenberg, received orders to go to Kamſkiatkein, and ſearch for a paſſage to Japan and America. In fine, he was the firſt who ſailed upon the Caſpian ſea, and paſſed by water from Aſtracan to Perſia; for the Armenians and Perſians, who before that time brought ſilk into Ruſſia, had always come by land. This ſilk being purchaſed by the Dutch, gave riſe to a new trade, which, under the ſucceſſors of Peter I. hath become very conſiderable, in the manner which we ſhall now relate.

An Engliſhman called Elten, who was an officer of the Ruſſian navy, had orders to make a map

map of the country near Ohrenborg; and this commiſſion gave him an opportunity of being minutely acquainted with the country. At his return to Peterſburg, he propoſed to the merchants of his own nation, that they ſhould bring ſilk from Perſia to Aſtracan, and afterwards ſend it to London, where it would arrive at a much ſmaller expence than that of bringing it by the way of Smyrna. His ſcheme was unanimouſly approved, and he himſelf employed to ſee it put into execution: having obtained the neceſſary permiſſion from the court of Ruſſia, he repaired to Perſia, and obtained all that he demanded from Schah Nadir. The merchants, charmed with the ſucceſs of this negotiation, immediately eſtabliſhed warehouſes at Ghilan and Aſtracan, and ordering two veſſels to be built upon the Caſpian ſea, put them under the conduct of Elten, to go and purchaſe ſilk. He acquitted himſelf of this commiſſion to their wiſh; and ſo effectually opened the road to thoſe who have ſince followed him, that this trade has been continued to the preſent time without interruption. As for him, he is ſaid to have entered into the ſervice of Schah Nadir, and to be now actually employed in building veſſels on the Caſpian ſea.

This commerce grew into great favour; and Schah Nadir, to whom it was as advantageous as to the Ruſſians and Engliſh, protected it to ſuch a degree, that a caravan of ſilk being pillaged in his territories, he ordered 40,000 rubles (being

ing 200,000 livres of France) to be paid to the Engliſh, to indemnify them for the loſs they had ſuſtained. Ruſſia took umbrage at their ſucceſs; ſhe was afraid that the Engliſh would communicate the European ſciences to Perſia, and, in order to deprive them of the means, at firſt decreed that they ſhould take none but Ruſſian ſailors, and afterwards prohibited them from uſing their large ſhips, or any other but the ſmall veſſels called Lotker, which have been at all times uſed in that ſea. Howſoever diſagreeable theſe reſtrictions might be, the Engliſh would not abandon a trade by which they gained ſuch conſiderable advantage. Such is the ſtate of the external trade of Ruſſia. The internal is carried on in this manner: we have obſerved, that in all the cities there are perpetual markets, to which people carry their commodities, and where the ſtrangers expoſe their goods, in ſhops that are detached from the lodging-houſes: we will add, that every ſhop contains but one ſort of merchandize. Independent of theſe markets, the merchants travel through the country, that they may have goods at a cheaper rate, as is uſually the caſe when they are bought upon the ſpot. They afterwards return to ſell them in thoſe ſhops, and mix with them all ſorts of handicraft work and foreign commodities, which they bring from St. Peterſburgh: but, excepting in this city and Moſcow, thoſe ſhops are inconſiderable; though there are towns in the provinces, in ſome of which there are more than in others. Great annual

markets are ſtill held, like our fairs, whither the inhabitants of the country and ſmall towns come to buy or ſell, according to their wealth and their occaſions. Strangers buy the Ruſſian commodities either in magazines, ſhops, or by contract. He who purchaſes in this laſt manner, pays at leaſt one half per advance to the Ruſſian merchant, who goes from place to place to buy the merchandize, which he brings at an appointed time, and then receives the other half of the ſum, or what remains to be paid, if the whole has not been paid before-hand. True it is, this manner of buying is not without riſque; but, at the ſame time, the commodities are not ſo dear as if they were taken in the magazines and ſhops; and beſides, one cannot always find what he wants, either in quantity or quality.

Foreign merchandize is ſold to the Ruſſians, as well for ready money, as upon credit for a year and a day; this laſt is the moſt uſual method, and ſhews how advantageous the foreign trade is to thoſe people, though for want of acquaintance and correſpondence, or for ſome other reaſons, they cannot as yet carry their own commodities abroad. The greateſt part of the foreign merchants ſettled in Ruſſia, are no other than factors, who trade by wholeſale with the Ruſſians, while theſe laſt ſell by retail.

The duty on merchandize within the country, is preciſely five per cent. a denuſca or de-

micopek (equivalent to half a ſol of France) of each griven, that is one copek for twenty, on all commodities ſold at the markets; and five roubles in the hundred, upon all the other merchandize within or without, which is brought into the towns to be ſold. When a ſtranger, ſettled in Ruſſia, imports commodities according to the value put upon them in Ruſſian money, he muſt pay the duties on the footing of two rix-dollars for a rouble; ſo that two rix-dollars being nearly equal to nine livres of French money, when the rouble is worth no more than five livres, he pays almoſt twelve per cent: therefore, he puts his effects, as much as he can, under the name of ſome Ruſſian. When goods are ſent to any part, he muſt pay five per cent. when he takes a permit from the cuſtom-houſe, ſpecifying that they have been viſited, and that the duty hath been paid: if the ſame goods are ſent back to the place from whence they were brought, or elſewhere; the proprietor, far from retrieving this money, is obliged to pay five per cent. again in the place where they arrive; and this as often as he takes a new permit. This regulation is, without doubt, an hardſhip; but, what renders it ſupportable is, that this duty in Ruſſia is in lieu of all the imports which are levied in other countries. In other reſpects, how advantageous ſoever it may be to the ſovereign, it is impoſſible at certain times, to export ſome kinds of merchandize, ſuch as the flour of wheat, rye, barley, oats, meal of all kinds,

kinds, butter, hemp, hemp-oil, peaſe, &c. For the Czar Peter I. made a law that ſtill ſubſiſts, forbidding any merchandize to be exported when it exceeds a certain price: for example, when a tun of rye ſells for more than one rouble, on the place of embarkation, it muſt not be ſhipped. And the ſame reſtriction takes place in all other commodities.

The ſovereign of Ruſſia, is the firſt and greateſt merchant of all that country; he alone, in the whole extent of his dominions, ſells all the beer, aquavitæ, metheglin, and all ſorts of liquors in general, either diſpoſing of them by farm, or keeping them in his own management: he likewiſe ſells ſalt, pitch, birch-oil, pot-aſhes, mouth-glue, and tobacco in the leaf, which is reduced to ſnuff, the Ruſſians not daring to ſmoke, becauſe in ſo doing they believe they ſhould commit a great ſin. In ſhort, part of the trade of Siberia, and the whole of that of China, of which rubarb is the chief commodity, is upon his account. Altho' the Europeans carry on their richeſt trade in Aſia, we muſt not imagine that is the caſe with Ruſſia. The trade of Europe is there ten times ſtronger than that of Aſia; and in the European trade, that carried on at St. Peterſburg, is oftentimes greater than that of Archangel; ſo likewiſe, by an eaſy calculation, we ſee that the commerce of Archangel alone, is equal to that which all Ruſſia carries on with Aſia. In the Peterſburg trade the Engliſh

overtop all others, and throw the greateſt quantity of money into the country.

The commerce of Aſia, comprehends that of Turky, Perſia, Siberia and China. The trade with the Turks is but trifling, carried on by the Coſſacks in ſmall lotkers upon the Don, and the ſea of Aſoph, between the Ukraine and the Crimea; the moſt conſiderable part being tranſacted from the city of Tzercaſkoi, to Caffa, and conſiſting chiefly in furs, cavear, Turky ſtuffs and coffee; but, it enriches neither the Coſſacks, Turks nor Ruſſians; and tho' one ſees at Moſcow, ſome ſhops of Turkiſh commodities, the duty ariſing from them is a meer trifle; nor are great funds required to carry on this trade.

The commerce of Perſia is not much more conſiderable than that of Turky; and they would be upon an equal footing, if the ſilk manufacture eſtabliſhed at Moſcow, did not take its raw ſilk from Perſia. This is the only advantage it has over that of Turky, with reſpect to the Ruſſians. The Tartars carry it on in ſmall lotkers, upon the Volga and Caſpian ſea, from Aſtracan to Ghilan, giving furs, leather, &c. in exchange for ſilk. At St. Peterſburg alſo are ſettled ſome Americans and Perſians, who by means of their correſpondents, bringing raw ſilk from their ſeveral countries, ſell it to the Dutch and other nations: this trade may amount to 50000 livres of Tournay, per year.

year. The Engliſh draw great advantage from this commerce: ſcarce a year paſſes, in which they do not tranſport from St. Peterſburg to London, upwards of 400,000 weight of raw ſilk, which is ſent to them from the warehouſes eſtabliſhed by captain Elten, at Aſtracan and Ghilan. Ruſſia does not draw in duties from Turky and Perſia, more than ſome thouſand roubles from each: and the trade of both, may roll on a ſtock of one hundred thouſand rix-dollars in commodities that are exchanged.

The trade with Siberia was eſtabliſhed by an event which, as we have only tranſiently touched upon it, we ſhall now more fully relate. That vaſt country was not under the dominion of Ruſſia, when Ivan Baſilowitz II. aſcended the throne; but, under his reign, a Coſſack pirate made himſelf maſter of it. He had ſerved in the troops of the Czar, where he learned the uſe of fire arms: and his name was Termak Timuſerwitz, or Jermak Thernafeowitz, that is, Hermon the ſon of Timothy. At his return to his own country, he at the head of 400 Coſſacks began to cruize upon the Volga, and equally pillaged both ſides of the river. The Czar having ſent troops againſt them, he took the reſolution of retiring into the country, as far as the river Tolbo, down the ſtream of which he ſailed thro' ſeveral deſarts. He warred with all the Tartars whom he met in this expedition, and eaſily ſubdued them, as well by the advantage

which his fire arms gave him over them, as by the valour of his Coſſacks, who are very good ſoldiers. But thoſe nations being poor, his booty was ſo inconſiderable, that all of a ſudden he found himſelf in want of money to pay his men, and munitions of war. He was therefore, compelled by neceſſity, to return to Solikamſki in Caſan, where he prevailed upon a rich merchant, called Stroganof, to lend him money, and furniſh him with neceſſary ammunition. With theſe ſuccours he marched back to the country he had diſcovered, made himſelf maſter of the whole, and having ſettled in it, beſtowed upon it the name of Siberia, from the firſt town he had met, which was called Siber. This town is at preſent entirely ruined; but, within a league and an half of it, the Ruſſians have built Tobolſki, which is now the capital of the Country.

Jermak, tho' in peaceable poſſeſſion of his new dominions, was ſtill afraid of the Czar's reſentment; and deputed ſome of the Coſſacks to that prince, to ſollicit his pardon, offering to put Siberia under his power, and to proceed in his diſcoveries, provided he would ſend him a reinforcement of Coſſacks and ammunition. The Czar, without heſitation, granted all that he demanded; and Jermak kept his word. He advanced farther and farther into Siberia, and ſubdued ſeveral Tartar nations, the princes of which he ſent priſoners to Moſcow. Prince Tzarewik,

Tzarewik, governor of Moſcow under the Czar Peter I. was great grandſon of the prince of Siber; and all the grandees of Ruſſia, who bear the name of Siberſki, are the deſcendants of other Tartar princes.

The Coſſacks built in Siberia, ſeveral fortreſſes with ramparts paliſſadoed, and great baſtions mounted with ſome pieces of cannon; and according to their ſize, furniſhed them with garriſons of one, two, or three hundred men. They levied a tribute upon the Tartars, conſiſting of furs and ſome other commodities; and to this day thoſe people pay no other: for the ancient inhabitants of Siberia do not furniſh recruits for Ruſſia, nor are they ſubject to the tribute of arms, or other impoſitions. There are not in this province any other ſoldiers than the Coſſacks, except ſome Ruſſian regiments in garriſon at Tobolſki and ſome other towns; and the body of troops lately ſent thither under the command of major-general Kinderman.

The Ruſſians having thus become ſovereigns of Siberia, built ſeveral towns, the number of which, at preſent, amounts to forty; they have even penetrated as far as Kaniſkiatkein upon the frontiers of China, where they founded the city of Argun, which they have ſince abandoned out of complaiſance to the Chineſe. Their trade in that country is not limited to furs and cotton ſtuffs brought from Chineſe Tartary: before the

treaty concluded between Peter I. and the Emperor of China, they had penetrated into that rich empire, from whence they brought ingots of gold to Moſcow. But, ſince that prince eſtabliſhed the trade on certain regulations, by means of Lange, who travelled eight times to China, the Ruſſian merchants enter that empire but once in three years, and in the other two of interval, the caravan muſt be contented with trading as they can upon the frontiers.

The caravan of Siberia, which brings the revenues of the crown, always joins that which is on its return from China, and both repair together to Moſcow, where they are ſubject to the inſpection of a chancery called Siberſki-Prikas. The flower of the commodities is taken for the uſe of the court, and the reſt ſold to the merchants, who put it off in the markets, or carry it thro' the provinces. None of the Siberian furs are exported from Ruſſia, except a few for Turky. The merchandize of China conſiſts in ſilk ſtuffs which are ſold in Ruſſia; in rhubarb, which goes moſtly to England; and in green tea, which is conſumed in the country: and it muſt be obſerved, that this tea is not ſo good as it was formerly. What accrues to the crown from the revenues of Siberia, and the trade of China, by the Siberſki-Prikas, is ſaid to have formerly amounted to a tun of gold; but, now that all things are upon a better footing, they are known

known to produce 300,000 roubles, or 1500000 livres of France.

The commerce that Ruſſia carries on with Europe, conſiſts in the trade of Poland, Archangel and St. Peterſburgh. That of Poland is chiefly by the way of Kion; and is ſo inconſiderable, that we need not ſtay to give a detail of it; all that can be ſaid of the matter is, that there is no great profit or loſs on either ſide.

Archangel is the ſeat of the Ruſſian trade in the white ſea, from whence goods are carried to the north eaſt of Ruſſia. It is intirely in the hands of the Engliſh and Dutch, who ſend thither about a ſcore of ſhips yearly; in the year 1745, it was a very extraordinary thing to ſee five and twenty: the duties, therefore do not amount to much more than twenty thouſand roubles; whence we may conclude that the ſum total of goods imported and exported yearly, cannot be above 400,000 roubles.

It cannot be ſaid that there is any trade at Kola, where one ſingle veſſel arrives annually from France, loaded with ſalt, and carries home ſalmon, the fiſhing of which is farmed by the French.

As for the trade of Puſtoſero, it is of ſuch little conſequence, that probably the generality of navigators do not even know the ſituation of the port. But that of the Baltic is as conſidera-

ble

ble as the others are weak. At Riga, the duties and anchorage raiſe annually about 120000 livres of France. The cuſtoms of Vibourg, Revel and Narva, amount to 20000 roubles each. But, as all the goods entered in theſe ports, are not for Ruſſia, and even thoſe exported, are not all the produce of that country, we ſhall not ſtay to explain the trade carried on in thoſe places, but paſs to that of Peterſburgh, which merits our principal attention. One half of the trade of this town is in the hands of the Engliſh: a fourth part carried on by the Dutch, and the reſt divided among other nations; as may be ſeen by the following liſt of ſhips that arrived in this port during the courſe of two years.

Liſt of the veſſels that arrived at St. Peterſburg, during the years 1744, and 1745.

	1744	1745
From Denmark	12	18
From England	115	69
From Holland	61	32
From Lubec	29	31
From Sweden	15	9
From Raſtok	12	11
From Hamburgh	6	7
From France	5	7
From Dantzic	5	6
From Kiel	2	2
From Steten	2	3
Total of ſhips	264	195

There

There is ſcarce any ſort of merchandize which is not imported into Ruſſia, and were we to give the detail of them, we ſhould be obliged to mention every thing we know: let it ſuffice to obſerve, that the moſt ſaleable are broad cloth, drugs, wine and painting. The commodities exported are not ſo various, but, the quantity of each kind makes up for the want of variety. The chief are iron, glue, cavear preſſed, leather, particularly Ruſſian leather, tallow, wax, furs, all ſorts of hides, hemp, linnen, and laſtly the ſilk that comes from Perſia.

Sum total of the merchandize exported from St. Peterſburg in the years 1744, and 1745.

	1744 roubles.	1745 roubles.
In vegetables	2156026	1262269
Animals	1450234	1414398
Minerals	140610	128595
Total	3746870	2805262

It was probably owing to the war declared in 1745 between France and England, that the trade to St. Peterſburg in that year, was ſo much leſs than in the preceding: the Engliſh and Dutch having ſent in the year 1745, about one half of their uſual number of ſhips.

A Ruſſian merchant does not ſell all ſorts of commodities: in that country they are divided into three kinds, namely, thoſe that ſerve for the ſuſtenance of man; thoſe that are neceſſary for his health, pleaſures and occaſions; and thoſe that are deſigned for his cloathing, convenience, and the different cuſtoms of his profeſſion. Each ſpecies is ſub-divided into ſeveral others, and for each there are particular merchants, as in Paris and all our large cities; conſequently the ſhops are much better aſſorted than thoſe where the merchants (as in ſome countries) ſell different kinds of merchandize. We muſt, however, except the apothecaries and grocers, who cannot poſſibly confine themſelves within ſuch narrow bounds. As for the reſt, they very rarely deal in two branches of buſineſs at once; or if they do, they take care to have ſeveral ſhops, and maintain a clerk in each of them. Thus, the Ruſſians attaching themſelves to one branch of trade, become good judges of the commodity in which they deal, and very dextrous both in ſelling and buying; and it is not at all ſurprizing to find among them a great number of rich merchants; eſpecially too, as they are prudent enough not to ſell at the ſame time, by wholeſale and retale.

But, if theſe cuſtoms of the Ruſſian merchants are laudable and uſeful in themſelves; we cannot ſay ſo much for that which we have already

already mentioned, of their keeping all their ſhops together in one place, at the extremity of the town. This is extremely inconvenient for thoſe that are remote from this quarter, and who in that reſpect, have no more advantage in ſtaying in town, than if they lived in the country. Beſides, it evidently hinders the conſumption and ſale: for, if proviſion is expended, ſooner than expectation; or people have forgot to renew it in time, or the bad weather diſcourages them from going too far abroad; it happens very often that they put up with the little they have; which, certainly would not be the caſe, were they nearer the ſhops. Indeed, at Peterſburg they begin to correct this inconvenience: and doubtleſs, the great extent of that city, is the cauſe of this improvement; which however, hath not as yet been made at Moſcow or any other city in Ruſſia. It would be extremely difficult, not to ſay impoſſible, to determine exactly the ſum to which the merchandize of Ruſſia amounts, including the import and export. As it varies every year, for an infinity of reaſons, it would be neceſſary to make obſervations for a ſeries of ten and twenty years; and after ſuch tedious labour, we ſhould find ourſelves engaged in ſuch an extenſive calculation, that we might be very eaſily miſtaken. But, without pretending to ſuch preciſion, we may eaſily reckon, that the export of this vaſt country exceeds the import to the value of five hundred thouſand roubles. The ſilver is brought thither by

by foreign veſſels, in rix-dollars of Holland, which are received at the cuſtom-houſe, and carried to the mint, where they are converted into roubles.

Hence we ſee the Ruſſians are conſiderable gainers by the trade ſo happily eſtabliſhed at St. Peterſburg by the Czar Peter I. eſpecially if we recollect that they ſell for ready money, or at leaſt one half advance, and the other at the delivery of the goods, and purchaſe by bills of exchange payable in a year and a day. It is therefore eaſy to foreſee, that in time great part of the riches of Europe, will fall into their hands, ſuppoſing things to remain in their preſent ſituation: but, what would be the caſe, were the arts and ſciences altogether tranſlated into that country?

Here, people will naturally aſk if this commerce is as advantageous to foreigners as to the Ruſſians; ſeeing they might buy the ſame goods at Riga and Koningſberg, as well as at St. Peterſburg, and ſo deſtroy the trade of this laſt city. The trade of Peterſburg, is certainly ſubject to great inconveniencies; the navigation is not free, except in five months in the year; that city is more diſtant than the others; the gulph of Finland is dangerous, eſpecially when the ice floats; beſides, the language, laws and cuſtoms of the country are unknown to ſtrangers: ſo that the voyages thither are longer,

ger, more difficult, and ſubject to many diſagreeable incidents.

But, on the other ſide, we muſt obſerve, that granting theſe inconveniencies greater at Peterſburg than at Riga, merchants at this laſt place, are obliged to purchaſe in alberts-daler, as in roubles at Peterſburg, tho' theſe two ſorts of money differ conſiderably in the exchange, which is much more advantageous to ſtrangers, upon Peterſburg than upon Riga. Beſides, ſtrangers ought to conſider, that altho' the commodities they enter are not ſo numerous as might be expected from a country of that extent, there is nevertheleſs a good quantity, which will increaſe yearly in proportion as that nation ſhall acquire more taſte for the conveniencies of life; as on their ſide they will aways find in ſuch a fertile country, new means and reſources for augmenting its revenues. We may therefore conclude, that foreigners find more advantage in trading to Peterſburg than to Riga or Koningſberg.

The Czarina Ann Joannowna publiſhed, on the ſecond of Auguſt 1731, a tarif of duties to be paid at Peterſburg, Narva, Wibourg, Kola, Pouſtoſcro and Archangel; which tarif we have in our hands, and if we have not communicated it to the public, it is becauſe we did not think it very intereſting to France, which carries on very little trade with Ruſſia.

The

The poſts were of very little ſignification before the reign of the Czar Peter I. and that Prince had ſcarce put them on a better footing when he died. Before his time, people were neceſſitated to ſend their letters by expreſs, or take the opportunities of travellers, as they preſented. But theſe travellers themſelves had no conveniencies for being tranſported from one place to another. They were obliged to buy a waggon, to hire horſes of the peaſants, and to proceed with all poſſible diſpatch, becauſe at that time there were no inns, the roads being naturally narrow, were ſcarce opened, and in a great many places very dangerous.

It hath been hitherto found impracticable to remedy all theſe inconveniencies, which ſtill ſubſiſt in the greateſt part of the provinces of the empire, as well as thro' all the Ukrain, the countries of Caſan and Aſtracan, together with Siberia. Ruſſia properly ſo called, that is, the governments of Archangel, Moſcow and Novogorod; as well as the provinces of Smolenſko, Lyvonia, and Finland, have neither inns, poſt-horſes, poſt-waggons, nor carriages; nor indeed any convenience for going from one town to another. The travellers muſt take care to buy their own waggons, or ſledges, and furniſh them with beds to lie upon, and to hire horſes from one ſtation to another. Of theſe they reckon four and twenty between Peterſburg and Moſcow; about the

the ſame number from Peterſburg to Riga; and ſo in proportion, upon the other roads of the empire. Between Riga and Peterſburg, you pay two copecs and an half per verſt for each horſe; between Peterſburg and Novogorod, one copec; and between Novogorod and Moſcow, half a copec. It muſt be remembered that the copec is worth a French ſol, and that there are four verſts and an half in one of our common leagues. But it muſt be obſerved, that, even for money, you will not be aſſiſted by the peaſants in any place, if you have not had the precaution to provide yourſelf with a paſſport from the government.

The poſtilions or poſt-boys wear no horns, and have nothing particular in their dreſs, except an eagle of copper, by way of badge, upon their breaſts. They continually whiſtle thro' the noſe, to ſpirit up their horſes, and always go at a great pace, without being deſired to do ſo, by the travellers. When they arrive at a ſtation, they of themſelves, take care to procure freſh horſes, without loſing one moment of time: by which means, one travels much quicker in Ruſſia than in any other country of Europe. A traveller going from Peterſburg to Moſcow, in the month of February made ſeven hundred and forty eight verſts in two and fifty hours: being equal to 166 common leagues of France.

You may likewiſe hire horſes for the whole journey: but, when it is long, you are expoſed to much difficulty; for, as there are no inns in Ruſſia, you are obliged to halt at noon and night in the houſes of the peaſants, where indeed lodging is not dear: but, notwithſtanding the good-will of the people, travellers are nevertheleſs under the neceſſity of carrying beds along with them, and almoſt every kind of neceſſary proviſion. However, between Peterſburg and Riga one finds in ſome ſtations Livonian poſt-maſters, who have accommodation in their houſes, as in other countries. In other reſpects, one is perfectly ſecure, whether in lodging with poſt-maſters or peaſants, and the roads are not more dangerous than they uſed to be, long journies being frequently made in Ruſſia without any troubleſome accident.

It is to Peter I. as we have already obſerved, that all the conveniencies of the roads are owing, if we except the eſtabliſhment of inns at the ſtations in Livonia, which was made by the Czarina Ann Joannowna. Before that prince, there was from Riga to Moſcow only a ſmall road, ſcarce paſſable, that ſtill ſubſiſts, and goes through Pleſkow. That from Revel and Narva to Novogorod being ſcarce known, Peter I. ordered a large high road to be made from Riga to Peterſburg, paſſing through Derpt and Narva. He cauſed another to be opened from Peterſburg to Novogorod, one hundred verſts long, in a ſtraight line;

line; he ſhortened the road from Peterſburg to Moſcow by two hundred verſts, and ordered the trees to be cut down upon both ſides of the road, which was levelled and bounded by ditches: he repaired all the highways; and in order to facilitate commerce and communication among his ſubjects, he neglected nothing that could accelerate journies, or render them leſs tedious or inconvenient.

It was this prince likewiſe, who in the year 1718, eſtabliſhed through all his dominions regular poſts for letters: he created two poſt-maſters-general, one at Moſcow, and the other at Peterſburg; and in every principal city of Ruſſia, inveſted a certain burgher with the office of expediting the couriers in their paſſage. Theſe poſts take charge not only of letters, but alſo of ſmall parcels, at a very reaſonable rate: for example, from Peterſburgh to Moſcow you pay but two kopecs for a letter of half a ſheet. Thoſe which go by the waggons, which is the moſt common conveyance, are not longer on the road than thoſe that go on horſeback. The poſt from Moſcow to Peterſburg, which carries the letters of the whole empire, in five days performs that journey, which is of two hundred leagues: he ſets out from the one city and arrives at the other twice a week.

The German poſt which comes from Riga, carries all the letters from Europe; arrives and ſets out twice a week, and is but five days on the

 road;

road; but, in ſummer, the Kromſtadt poſt ſets out and arrives every day. There are two packet-boats, that ſail from Kronſtadt to Dantzick, and from Kronſtadt to Lubeck: theſe are ſhips of war, carrying from twelve to fourteen guns, and from ſeventy to fourſcore men. Each of theſe veſſels, in ſummer, makes two trips from the one city to the other, on pretence of maintaining an uninterrupted communication between Ruſſia and Germany, for tranſporting paſſengers and packets; but the principal aim of the government, in appointing theſe voyages, is to exerciſe the ſailors and volunteers.

We ſhall conclude this memorial by obſerving, that France (as we have ſeen) carries on very little trade with Ruſſia, although the commerce between theſe nations might be very conſiderable. In France are produced all ſorts of merchandize, generally at a cheaper rate than in any other nation; and there is a conſumption for all kinds of commodities, in Ruſſia, that is at Peterſburg: The greateſt obſtacle, people will ſay, to the increaſe of the trade of France, is the French manner of navigating, which is more tedious than that of other nations, who, beſides, are not at ſuch a diſtance from Ruſſia: but a little courage in the French merchants, and the protection of their court, would ſurely balance theſe inconveniences, and raiſe them to that point of ſuperiority, which their other advantages ought to enſure.

AN ACCOUNT OF THE COMMERCE OF DENMARK.

THE trade of the Danes now more than ever attracts the eyes of Europe. The wiſe prince who at preſent governs that nation, and who ſeems to have no ambition but that of making it happy, thinks nothing beneath his care which may encourage the commerce of his ſubjects. The ardour with which he has for ſome protected it at the court of London, as well as the conſiderable expence he has been at in procuring new branches of traffic to his ſubjects, and in forming new ſettlements, ſeem to promiſe them ſuch ſucceſs as muſt even tranſcend their hope. As the engagements in which we have entered with the public, obliges us to explain the trade of all the European nations, together with the variations which in all probability it will undergo; the circumſtances we have reported, which for ſome time have entertained the world in all the

public papers, give us reaſon to believe, that what we now propoſe to ſay on the trade of Denmark will be received with pleaſure; more eſpecially, as the French authors have ſcarce touched upon this ſubject.

The trade of Sweden, Denmark and Norway, was anciently very inconſiderable: the Hans-Towns had engroſſed it, excluſive of theſe dominions; and the great privileges which they ſucceſſively found means to obtain for themſelves, almoſt entirely tied the hands of the people of theſe countries. As it is impoſſible to give a juſt idea of the origin and progreſs of trade in any of theſe kingdoms, without firſt explaining the riſe, progreſs and decay of that of the Hans-Towns, it will be abſolutely neceſſary to take a review of the time at which that famous ſociety began to be formed. Authors are little agreed about this epocha; ſome ſaying that the firſt aſſociation was made in the year 1220, while others place it in other periods. It appears, however, by old diplomas and charters which have come down to our times, that ſeveral cities of Germany, of which Lubeck and Hamburgh were the principal, had entered into a league for the ſecurity of their trade, before the beginning of the twelfth century.

Several other trading towns ſoon perceived the advantages that would reſult to them from ſuch an union, and eagerly engaged in the ſame aſſociation,

ciation, which was afterwards known by the name of the Teutonic Hanſe, and at length became the arbiters of the North. All the neighbouring powers courted their friendſhip, and in their mutual quarrels referred to their deciſion. Peter Bertius ſays, in one part of his works; "Certain it is, the body of theſe towns, by their "interpoſition, have put an end to great wars, "and often ſtifled the quarrels of neighbouring "kings and princes in the birth; for it was "thought that their power would give too great "a ſuperiority to that ſide for which it ſhould "declare; ſo that for ſeveral centuries they were "juſtly looked upon as guarantees of the public "peace, and conſervators of the tranquility of "the empire." The celebrated hiſtorian Chytracus believes, that the number of Hans-towns amounted to upwards of fourſcore; but others think the number was not ſo great. Be that as it may, it is certain that in the great aſſembly held at Lubeck in the year 1494, they were ſeventy-two in number, and in 1554 there were ſixty-three in that ſociety.

The cities that compoſed the body of the Teutonic Hanſe were diſtributed into four claſſes, each of which had at its head, one of the principal towns, which were uſually called Towns of the Quarter. At the head of the firſt claſs, as of the whole union, was the city of Lubeck, which was at that time very rich and powerful: it was entruſted with the archives and common ſtock of

the ſociety, and its department comprehended all the cities of the Venidians and of Pomerania, which had been admitted into the alliance. Cologn was the quarter-town of the ſecond claſs, comprehending the aſſociates of the country of Cleves, Lamarck, Weſtphalia, Guelderland and Overyſſel. Brunſwick was at the head of the third claſs, including the towns of Saxony, which had been received into the ſociety. We find, that in the year 1437 this quarter-town was excluded from the union, on account of a contravention, by which it had incurred the diſpleaſure of all the aſſociates. It was however reſtored, by the unanimous conſent of the Hans-Towns, in a general aſſembly held at Lubeck; but was forced to do public penance in the perſons of its deputies, who walked barefoot, with tapers in their hands, before thoſe of the other towns, from the church of Notre Dame to the Town-houſe, and then aſked pardon on their knees. Dantzick was at the head of the fourth claſs, which comprehended the cities of Ruſſia and Livonia. The union of theſe towns being well cemented, they put in practice every thing that could contribute to their mutual preſervation, and to make their trade flouriſh. With this view, they courted the favour of ſeveral princes, and found means to obtain every where very conſiderable prerogatives and privileges. They were permitted, in many ſtates, to eſtabliſh warehouſes or factories for the convenience of their commerce, one of theſe being ſettled at London in the

the reign of Henry III. who favoured it with great immunities. This advantage was the fruit of a ſervice done to that king during a very dangerous war. The Hans-Towns had granted him ſuccours, on condition that he ſhould pay them in ready money for the ſhips which ſhould fall into the enemy's hands, or periſh in the war by the accidents of fortune. The war being ended in a manner very advantageous to Henry, a great number of ſhips belonging to the Hans fleet were damaged in their return to their own ports, and the king was not in a condition to indemnify his allies for the loſs they ſuſtained; he therefore came to a compoſition with them, and, by a public act, granted them the liberty of buying and ſelling all ſorts of merchandize in England, without paying any other duty than one per cent. of the value. The ſucceſſors of Henry III. not only confirmed theſe privileges, but even extended them; and the Hans-Towns peaceably enjoyed the advantages that reſulted from them, till ſuch time as the Engliſh plundered ſixty of their ſhips. This was an act of revenge in this nation; for the ſhips of the Teutonic Hanſe had taken ſome Engliſh veſſels in the North ſtrait. This quarrel was followed by a war of three years, which was at length terminated by the mediation of Charles duke of Burgundy. This peace put the Hans-Towns in poſſeſſion of all their immunities, in which they received no interruption during the reigns of Richard III. Henry VII. and Henry VIII. but under Edward VI. the face of affairs was

was changed: ſome merchants of Dantzick, having imported into England a great quantity of Poliſh merchandize as their own, and thereby defrauded the cuſtom-houſe, the Engliſh merchants took occaſion from thence to repreſent to parliament, how much the privileges granted to thoſe towns prejudiced the nation, and obtained an act, which aboliſhed all that was granted to them ſince the time of their union. This ſuppreſſion of privileges occaſioned frequent conteſts between the two parties, the particulars of which it would be too tedious to relate.

After the death of Edward, his ſiſter Mary reinſtated the Hans in their antient privileges; but the great Queen Elizabeth no ſooner aſcended the throne, than being ſenſible how prejudicial they were to her ſubjects, ſhe revoked them for ever. Camden, who has writ the hiſtory of that Queen, relates the particulars of this abolition, which, not content with approving, he judges worthy of praiſe. The confederated towns, on their ſide, publiſhed in the German language a writing, intituled, *A vindication of the German towns united under the name of Hanſeatiques, with a proteſtation againſt ſome writings lately publiſhed, in which the moſt antient Hans-Teutonic is decried as an unlawful league.*

The ſecond factory of this ſociety was at Bruges in Flanders, and flouriſhed greatly from the year 1262 to 1488; but, when that city was

ſhut up by the Emperor Frederick III. on account of its revolt againſt Maximilian, the factory was, at the deſire of the city of Lubeck, tranſferred to Antwerp, where a noble houſe was built for the ſociety. But, in the ſequel, the trade of Amſterdam being formed with all poſſible ſucceſs, that of the Hans-Towns daily diminiſhed.

At Novogorod in Muſcovy was the third large factory belonging to this company, which flouriſhed without interruption for three whole centuries; but the rigorous government of Ivan Baſilowitz, obliged the proprietors to transfer it into Livonia, firſt to Revel, and afterwards to Narva, where the wars of Sweden at firſt weakened, and at length totally deſtroyed this commerce.

The fourth of theſe factories was ſettled at Bergen in Norway, being one of the moſt conſiderable of the whole; but it had the ſame fate with the reſt, having ſuffered greatly in the long wars of the North, until it periſhed entirely under the reign of Chriſtian III. King of Denmark. Under this prince it was, that the Danes began to traffic by themſelves, and the government of Denmark gradually retrenched the prerogatives, which the Hamburghers and Lubeckers had till that time enjoyed, to the prejudice of the nation. Theſe laſt oppoſed the reſtrictions in the year 1554, and next year the king held a diet at Copenhagen, at which the deputies of Lubeck appeared, and greatly expatiated upon the privileges

and

and prerogatives which the former kings had granted to the Hans-Towns; but the King and Council there aſſembled, anſwered, " That they " were ignorant of the alledged privileges, eſpe- " cially thoſe they pretended to have obtained " one hundred years ago: that in caſe any ſuch " exiſted, they knew as little how far they might " extend; but that they might ſhew the origi- " nals, and give copies of them to the ambaſſa- " dors which the king would ſend to Lubeck for " that purpoſe." This expedient was actually executed, but the diſpute was not determined during the reign of Chriſtian III. The diet held at Odenſee in the year 1560, reſumed the conſideration of this affair, and formed an edict, which, among other articles, contains certain explanations of the privileges of the Hans-Towns in Denmark and Norway. Huitfeld has inſerted this edict in the life of King Frederick II. but it is looked for in vain in the printed annals of the ſame author.

The Hamburghers, not contented with the great privileges they enjoyed, had put themſelves in poſſeſſion of a right upon the Elbe, which they called the Right of Reſtriction, and believed themſelves authoriſed to exclude all the towns ſituated below them from a free navigation on that river. They compelled their veſſels to bring to Hamburgh all the corn they had to ſell, and for the juſtification of this right, alledged the privileges they had obtained from the Emperors. This

This they rigorouſly exerciſed, and likewiſe prohibited the inhabitants of Holſace, who were ſubject to the crown of Denmark, from tranſporting their merchandize to any other part than Hamburgh, where they were obliged to ſell them at the price they (the Hamburghers) ſhould pleaſe to fix. While the kings of Denmark were hindered by domeſtick troubles from thinking of external affairs, Hamburgh and ſome other Hans-Towns enjoyed this impoſition in quiet; till Chriſtian II. (who, notwithſtanding all the evil that hiſtorians have ſaid of him, was poſſeſſed of very good qualities) undertook to aboliſh it entirely. He began by publiſhing a manifeſto on this ſubject, dated at Copenhagen in the year 1521, the authenticity of which Huitfeld ought not to have called in queſtion; but a revolt which happened at that time hindered the King from executing his deſign, and the Hans-Towns profited by this conjuncture, ſo as to regain poſſeſſion of their prerogatives.

What we have here advanced, may be ſeen in the declaration of war which this trading ſociety publiſhed againſt Chriſtian II. in the year 1523. Chriſtian III. brought this affair again upon the carpet, and in a declaration to the city of Hamburgh, deſired that his ſubjects might be no longer interrupted and diſturbed in their navigation and lawful trade; that Hamburgh ſhould reſtore the veſſels which it had taken, or ſhew its title to this pretended right upon the Elbe, otherwiſe he would

would apply more effectual remedies to its enterprises. The King, perſuaded that this city had ſeized the Right of Reſtriction during the troubles of Denmark, and that it never could ſhew a legal title, inſiſted the more upon its being produced, and in the mean time, demanded that the trade of his ſubjects ſhould not be hampered in any ſhape. Notwithſtanding this declaration, the Hamburghers believed their right was inconteſtable; they alledged a poſſeſſion from time immemorial, confirmed by privileges obtained at different times; and as Chriſtian III. was a very pacific prince, this affair had no other conſequence, until Frederic II. aſcended the throne: this King renewed the pretenſions of his crown, and the Hamburghers oppoſed him more briſkly than ever, having fitted out a ſhip of war that obliged all veſſels laden with corn to go to Hamburgh.

In the year 1561, Frederick II. reclaimed a veſſel which they had taken upon the coaſt of Delmarſchen, and they refuſing to diſcharge her and indemnify the owners, the King laid an embargo upon all the ſhips belonging to that town which were in the ports of his dominions. Such a thunderbolt made the ſmall republic tremble. It demanded the protection of the electors of Saxony and Brandenburg, and by their means the quarrel was determined at Copenhagen, on the fourth of May 1562. The Hamburghers paid to the King forty thouſand livres, promiſed to give no cauſe for ſuch diſputes for the future,

and obliged themſelves to ſubmit their pretended right upon the Elbe to the examination and deciſion of impartial arbitrators: but this examination they long delayed, taking advantage of the war in which Denmark was the following year engaged. The King was ſo much incenſed at this delay, that he excluded the ſhips of Hamburgh from all the ports of his dependance; and this rigour was ſo ſenſibly felt by the inhabitants of that city, that they ſued for an accommodation, and obtained it in the year 1579, at the diet of Flenſburg; but on condition that they ſhould pay the ſum of four hundred thouſand livres in the ſpace of five years. It was likewiſe agreed, that a congreſs ſhould be held at Kiel in Holſace, to remove entirely the difficulties that ſtill remained on either ſide; that in the mean time, the navigation of the Elbe ſhould be free, and every thing regulated in conformity with the edict of 1562. The arbitrators choſen to decide the difference, at length pronounced, that excepting buck-wheat, and grain prepared for the making of beer, both ſides ſhould equally enjoy the liberty of tranſporting all ſorts of corn whitherſoever they ſhould think fit; that the Hamburghers ſhould no longer fix a price upon the merchandize belonging to the inhabitants of Royal and Ducal Holſace, but that theſe laſt ſhould be at liberty to make their own markets with the purchaſer.

This ſentence was very unſatisfactory to the city of Hamburgh, which would never ſubſcribe to it; and the diſputes upon the Right of Reſtriction remained ſtill undecided in the reign of Frederick II. but this King always continued in ſtrict alliance with the crown of Spain, which furniſhed the Low Countries with an opportunity to extend their trade into Denmark and the Baltick.

Chriſtian IV. an active prince, and great in all his conduct, no ſooner aſcended the throne than he turned his views to commerce, and endeavoured to remedy the abuſes by which it was hindered from flouriſhing: with this intention, he ſent ſome ſhips of war towards the Elbe, to protect his ſubjects from that Right of Reſtriction, which appeared inſupportable: the Hamburghers, relying ſtill upon the protection of the Emperor, and the aſſiſtance of the other Hans-Towns, ſeemed at firſt reſolved to oppoſe force by force; but before things proceeded to ſuch extremity, the diſpute was lulled aſleep for ſome time, by the treaty of Steinbergen, concluded in the year 1621.

Some years after this tranſaction, the city of Hamburgh obtained from the Emperor a charter, which anew ſecured to it the dominion of the Elbe, and encouraged it to diſturb, as formerly, the trade of the neighbouring ſtates: the King of Denmark, therefore, found himſelf obliged again

again to order ſome ſhips of war to cruize at the mouth of the Elbe, in order to protect the commerce of his ſubjects. This was not all: he likewiſe eſtabliſhed a cuſtom-houſe at Gluckſtadt, where, by way of repriſal, he exacted paſſage-money from all the ſhips of Hamburgh. Theſe repriſals were followed by an open war, that proved very diſadvantageous to the city of Hamburgh, which was fain to make great ſubmiſſions to the King, and engage to pay the ſum of eleven hundred and twenty thouſand livres. Since that period, the trade of the Hans-Towns hath declined, as that of the Northern Kingdoms hath increaſed.

Nevertheleſs, it cannot be ſaid, that before Chriſtian V. the Danes carried on any conſiderable trade in their own bottoms; the greateſt part of the merchandize wanted by that nation was imported by foreigners, eſpecially the Dutch, who, in exchange, loading their ſhips with the produce of the country, returned, after having manufactured it, to ſell it with great profit to thoſe very people from whom it had been formerly purchaſed. Foreigners at that time did in Denmark, what is now done by the Engliſh with regard to the Canary Iſlands, where they buy wine, which they ſend back for ſale, after their vintners have beſtowed upon it a certain flavour.

But ſince the year 1671, the trade of the Danes has begun to change its appearance; they at that time built a conſiderable number of ſhips, which

 ſerved

ſerved equally for war or commerce; ſo that they were called Ships of Defence: but, before that æra, the inhabitants of Denmark and Norway cannot be ſaid to have trafficked in their own bottoms: on the contrary we find, that although there were veſſels of defence under Chriſtian IV. the trade being in its infancy, was very inconſiderable, and the ſhips built for carrying on and protecting it, abuſed the privileges granted to them in 1612, and acquited themſelves very ill of their duty. The King complains of them very much, in an ordonnance ſigned on the third of June 1644, on board of the ſhip Trinity, which was then in the harbour of Flakeroc; and as there is no mention made of theſe veſſels of defence ſince that time, they ſeem to have been totally ſuppreſſed after the peace of 1645. But Chriſtian V. believing that if by wiſe precautions he could prevent the abuſes which the owners had formerly committed, they might be re-eſtabliſhed for the advantage and ſecurity of the trade of his ſubjects; he on the 24th of May, in the year 1671, publiſhed a declaration, containing the privileges which he thought proper to grant to the ſhips of defence, together with the regulations which they were ſtrictly to obſerve. He allowed ſtrangers as well as his own ſubjects, to build or ſhare in the outfit of them: he granted the ſame privileges to both, and ordered all the ſhips to be built according to a model which was at Copenhagen. He chiefly favoured thoſe adventurers who fitted out ſhips of 34 or 36 guns, granting

granting to them, for example, one laſt of Portugueſe or Spaniſh ſalt: the ſhips of 24 guns were taxed but at four and thirty livres per laſt; on this condition, however, that they ſhould load the merchandize themſelves in Portugal or Spain.

This privilege was likewiſe granted to ſhips of twelve guns, who went to trade in England, Holland, France, Scotland, Ireland, and on the coaſts of the Baltick and German Ocean; and in return for theſe privileges, the ſhips were always to be ready for the ſervice of the ſtate, when the King ſhould demand them. Veſſels of ſix guns, which went to trade in the ſea of Iceland, where great ſhips can be of no uſe, were to enjoy the ſame advantage in time of peace, and ſerve for tranſports in time of war. The King, moreover, declared, that he would levy no tax or cuſtom on the materials uſed in ſhip-building; he likewiſe exempted thoſe that ſerved in them from all taxes; but before the owners could enjoy all theſe privileges, their ſhips were ſubject to be examined by the department of admiralty and commerce. He alſo decreed, that two thirds, or at leaſt one half of the crews, ſhould always be compoſed of his native ſubjects; that whilſt theſe ſhips ſhould be in the King's ſervice, their owners ſhould be contented with the ſame freight which was paid to other veſſels, and engage to ſell their ſhips to no foreigners, until they ſhould have been ten years in the ſervice of the nation.

That the owners might be indemnified for the loſſes they ſhould ſuſtain in time of war, they were permitted, while the war laſted, to continue their trade with ſuch other ſhips as they ſhould think proper to employ, without being ſubject to any other duties than thoſe we have ſpecified. The ſame King afterwards confirmed all that was contained in this declaration, by another dated on the 28th of January 1669, importing, beſides the confirmation of theſe privileges, that in caſe the King ſhould have occaſion for the ſhips of defence, the owners ſhould have notice three months before-hand, at the expiration of which term, they ſhould be in good and ſerviceable condition, manned with ſixty men each; that the admiralty, on ſuch occaſions, ſhould give notice for how much time proviſions ſhould be put on board; that ſo long as each ſhip ſhould remain in the King's ſervice, 3400 livres ſhould be paid monthly to the owners; and that, in caſe the King himſelf ſhould contribute to the equipment, they ſhould receive no more than 2200 livres. Theſe prudent diſpoſitions excited the zeal of the Danes, who began to apply themſelves more eagerly than ever to trade: they built large ſhips, to go and purchaſe foreign goods at the firſt hand, and ſo conſiderably diminiſhed the profits which the Dutch and Engliſh reaped from them. The city of Bergen in Norway eminently diſtinguiſhed itſelf by the number of theſe ſhips of defence, the command of which was given to one of their principal burghers, in quality of *Schout-by-nacht*, or

or vice-admiral. The inhabitants of all the countries depending on the King of Denmark, afterwards profited by the troubles or war in which the greateſt part of Europe was involved: they enjoyed uninterrupted peace long enough to extend their commerce conſiderably, and at length to raiſe it to a moſt flouriſhing condition under the reign of Frederick IV.

As all the views and conduct of that worthy Prince related to the good of his ſubjects, the increaſe of their trade engroſſed his whole attention. At the end of the long war with Sweden, he perceived with concern the great diminution in the trade of his capital. The cities of Denmark ſituated upon the coaſt of the Baltick, had ſet on foot a traffick, by bringing in foreign bottoms all ſorts of merchandize, particularly wine, aqua-vitæ, ſalt and tobacco, which they afterwards ſold to the ſmall towns of the kingdom. Now, as the commodities entered in their ports payed very little or no duty, the inhabitants of Copenhagen found it impoſſible to afford thoſe they had at ſuch a moderate price: wherefore the King publiſhed a declaration, dated on the firſt of July 1726, importing, that for the future the ſalt, wine, aqua-vitæ and tobacco, deſtined for the uſe of the provinces, ſhould be brought to Copenhagen, where theſe four ſpecies (as they were uſually called) ſhould pay entry, and that all the other towns ſhould ſend thither to provide themſelves.

This declaration was ſtrenuouſly oppoſed: the provinces repreſented it as an innovation, by which the capital ſought to acquire a prerogative, which till that time it had never enjoyed; that in thus cramping the trade, they would raiſe the price of merchandize too high; that the cities ſituated upon the coaſts of the Weſtern ſea, having been uſed to ſend abroad their own ſhips to purchaſe thoſe proviſions from foreigners, equity required that the ſame liberty ſhould be continued; and that this ordonnance not only deprived them of a great advantage, but even rendered them incapable to make the leaſt uſe of their ſhipping. To this repreſentation the merchants of Copenhagen replied, that in executing the King's declaration, the expence of freight which the other towns payed to the French and Spaniards, would remain in the Kingdom, and that it was more juſt to give this money to the inhabitants of Copenhagen than to foreigners, by which means the duty would be conſiderably augmented; that theſe were the only means for ſaving the trade of the capital from immediate ruin; and that the riſe in the price of the four ſpecies deſerved no attention, in compariſon with the advantages which would attend it, and amply indemnify the ſtate.

Theſe laſt reaſons appearing the ſtrongeſt to the King, he ordered the ſaid commodities to be brought to Copenhagen, before they could be ſold in

in the provinces; but, at the ſame time, liberty was granted to every individual to buy them in France and Spain at the firſt hand, and import them to Copenhagen in his own bottoms. The King, that he might favour the progreſs of trade ſtill further, diminiſhed the value of the coin, and expreſsly ordained, that the inhabitants of his capital ſhould go in perſon to purchaſe the four ſpecies in France and Spain; for, he reaſonably judged, that not only the expence of the freight would remain in his country, but likewiſe that theſe voyages would render his ſubjects more expert in all the different branches of navigation.

It is well known, that the Danes not only trade, like other northern nations, to Spain, France, England, Holland, and upon the coaſts of the Baltick; but, that they have likewiſe made ſettlements in the Eaſt and Weſt-Indies, as well as in Guiney and Greenland, whither they have ſent colonies; and that to render their enterprizes more ſucceſsful, they have formed trading companies, in imitation of ſome other European nations. To give, therefore, a compleate idea of the trade of this people, it will be neceſſary to treat of all its branches, and explain each of theſe ſettlements in particular. The Daniſh writers are juſtly blamed for having ſaid nothing of the origin of the trade which their nation carries on to the Eaſt-Indies. The journal of one Giedde, is the only creditable piece we have on the ſubject; but the narrative is ſo

conciſe, that it is impoſſible to extract a perfect knowledge from it. Baldæus, a Dutch author, gives us to underſtand, that Marcheles Boſhouwer was the firſt who inſpired the Danes with the idea of ſeeking their fortune in the Eaſt-Indies; but in that, as in many other caſes, he is miſtaken. True it is, that famous Dutchman went thither with the firſt ſhips which made that voyage, under the command of one Giedde; but from thence it does not follow, that the Danes had not before formed the deſign of undertaking that commerce. We ſee the contrary, in a declaration of the king ſigned at Antwarſchau on the 17th of March 1616, wherein he approves the ſcheme of an Eaſt-India company. There he gives his conſent for making a beginning, by building in his dominions two ſhips for going to double the Cape of Good-Hope, in order to trade to the Indies, and for building afterwards as many as the circumſtances and advantage of the trade would require. At the ſame time, he grants to the company the excluſive privilege of that trade, forbidding all his other ſubjects to ſail beyond the Cape, on pain of death and confiſcation of goods. But he allows them all to engage in the ſociety, tho' no ſhare ſhall be leſs than the ſum of 600 livres, unleſs the company ſhall afterwards think proper to make ſome alteration in this particular. The company ſhall enjoy theſe privileges for twelve years, reckoning from the year 1616; and at the expiration of that term, the king promiſes to prolong them as

as much as the good of the ſtate ſhall appear to demand. He likewiſe ordains, that the profit ſhall be divided among the proprietors as often as the company's trade ſhall have produced fifteen per cent. advantage. In fine, the King, in conſideration of theſe privileges, exacts from the company two thouſand pieces of gold, called nobles, at the firſt return of the ſhips.

This ſcheme, approved and ſubſcribed by the King, ſhews plainly that Boſhouwer was not the firſt who projected it; for, he did not go to Denmark till the year 1617, tho' he arrived exactly at the time when they were employed in putting it in execution. But we cannot preſent our readers with the hiſtory of the Daniſh ſettlements in the Eaſt-Indies, without making them acquainted with this ſingular perſonage: Marcheles Boſhouwer was a Dutch factor, at that time when the Hollanders undertook to deſtroy the trade of the Portugueze in the Eaſt-Indies: the United Provinces and Maurice prince of Orange ſent him to Ceylon, to conclude a treaty of commerce with the Emperor of that iſland. He performed that negotiation with great ſucceſs; both parties being equally ſatisfied with his conduct: the Emperor eſpecially, was ſo ſtruck with his abilities and merit, that he deſired to keep him at his court; and Boſhouwer ſtaying, was raiſed to the firſt dignities of the empire of Ceylon. He was declared Prince of Migomme, Cocklecorle, Annanogoporre and Nivitegael; and

and the Emperor conferred upon him the offices of preſident of the council of war, privy counſellor and high admiral. All his titles may be ſeen in a letter written by his own hand, to Chriſtian IV. dated from the Cape of Good-Hope, on the 27th of July 1619; and theſe honours and this fortune muſt have ſurpaſſed the moſt ſanguine hopes of a ſimple factor. After ſome time, he reſolved to return to the place of his nativity, doubtleſs, to diſplay all his grandeur to his countrymen; and the Emperor of Ceylon gave him leave, after repeated ſolicitations. At his return to Holland, he expected to be treated in quality of prince of Migomme; but he verified the proverb, which ſays, a prophet has no honour in his own country. His metamorphoſes ſeemed incomprehenſible to the Dutch, who could not conceive how, in leſs than three years, a man like him ſhould become a prince; and therefore refuſed the honours which he claimed in that quality.

Boſhouwer was ſo much piqued at this refuſal, that he quitted Holland; and underſtanding that the Danes were then buſy in eſtabliſhing an Eaſt-India company, he ſet out for that country, where he arrived in the year 1617; and offered to eſtabliſh the trade of the Danes in the iſland of Ceylon. Chriſtian IV. reliſhed his propoſal, and the company was formed with all expedition. Boſhouwer, who every where aſſumed the title of prince of Migomme, ſoon after concluded

cluded a treaty with the King of Denmark, in the name of the Emperor of Ceylon. Baldæus ſays the King ſigned it on the 30th of March 1618; but from the ſame treaty found in a Dutch manuſcript, it appears to have been ſigned on the ſecond of Auguſt. Baldæus is conſequently miſtaken; or rather, two conventions of the ſame kind have been concluded at different times. That ſame year, the prince of Migomme undertook a voyage to Ceylon, with a great ſhip and a yacht, to which the company ſent an eſcort of five ſhips of war and a yacht, after having given the command of the two to one Giedde. This fleet arrived at Ceylon on the 16th of May 1620, after a tedious voyage of two and twenty months. Baldæus, whom we have already quoted, ſays that the prince of Migomme died in the voyage; but a new treaty of commerce concluded between the King of Denmark and the Emperor of Ceylon, ſhews that he is miſtaken; for, in this, mention is often made of the prince, as being abſent and on board of the Daniſh fleet. It ſeems, therefore, that this ambaſſador did not die, till ſome time after his arrival in the Iſland of Ceylon.

The ſubſtance of this treaty, which is ſtill to be ſeen in Daniſh, is, that by virtue of full powers granted to the prince of Migomme, ambaſſador from the Emperor of Ceylon, an eternal alliance hath been concluded between the King of Denmark and the ſaid Emperor. That this laſt grants

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to the Danes, and other merchants who ſhall accompany them, the liberty of trading thro' his whole empire, and with all his ſubjects; that they ſhall be permitted to export from the iſland of Ceylon, all ſorts of ſpice, precious ſtones and other merchandize which they ſhall chooſe to purchaſe; and enjoy theſe privileges excluſive of all other nations; that the prince of Migomme, his wife and children, ſhall remain as hoſtages on board the fleet, until the Emperor of Ceylon ſhall have put into the hands of the Danes the gold and precious merchandize, which he is to give them in pledge till the performance of his promiſes; that the Danes ſhall never pay entrance or clearance for their merchandize; that the Emperor ſhall oblige himſelf to procure for the company all ſorts of merchandize, at a lower price than that they are ſold at elſewhere; that for example, if a bag of pepper coſts eight rials at Bantam, the Danes ſhall pay but ſix; and for other things in proportion; and finally, that the Emperor ſhall protect the trade of the company in the dominions of all the Indian Kings with whom he is in alliance.

Whether this treaty was concluded aboard the fleet, by the plenipotentiary, or in Ceylon with the Emperor, it ſtill follows, that the prince of Migomme was alive when the veſſels of the company arrived in that iſland: but his death overturned the projects of the Danes, and intirely annihilated the hopes with which he had inſpired them. The Emperor would not conſent to any one thing which his ambaſſador had promiſed, in

in his name; and even denied that Boſhouwer had ever been charged with ſuch a negotiation. Ove Giedde, finding he had been impoſed upon, confiſcated all the effects of the defunct, to indemnify his nation for the expence of the undertaking. Boſhouwer's widow was, at her own deſire, put aſhore, with the young women who were in her ſervice, and ſhe was left in poſſeſſion of as many of her huſband's effects, as were ſufficient for her ſubſiſtance. Baldæus is again miſtaken, when he ſays that this enterprize having miſcarried, Ove Giedde returned immediately to Denmark. That commander gives us to underſtand, in his own journal, that from Ceylon he ſailed to the coaſt of Coromandel, where, after a long and difficult negotiation, he obtained the diſtrict of Tranquebar, from the Naické or King of Tranſiour; and in this place was built the fortreſs of Danſborg, where the company ſtill maintain a garriſon. Tranquebar, at the time of its being acquired, was no more than a good village; but, under the Daniſh dominion, it is become a conſiderable city: the company pays yearly two thouſand perdous to the King of Tranſiour, in conſequence of the contract of purchaſe. The city is at preſent ſurrounded with a ſtrong wall, and all the baſtions are mounted with cannon. It has three churches; one called Sion, where the ſervice is performed in Daniſh; another which bears the name of Jeruſalem, was built for the converted Malabares; and the third belongs to the Ro-

man-Catholicks. Beſides theſe, there is at Tranquebar a large moſque for the Mahometans, and five great pagods for the Idolaters. The inhabitants are divided into Europeans, Moors and Malabares, theſe laſt being the moſt numerous. The Danes have laboured with great zeal at their converſion; having ſince the Year 1710 ſent thither a great number of miſſionaries. They have tranſlated into the Malabar language the Holy ſcripture, and ſeveral books of devotion, which after having been printed in Germany, at a great expence, were tranſported to the Indies, in order to be diſtributed among the new converts. On the city of Tranquebar ſtill depend fifteen burroughs, the moſt conſiderable of which is Borejar, almoſt equal to Tranquebar in the number of houſes. The Naicke of Tanſiour is but a petty King; his whole country being but about ſixty leagues in length; his capital is Tanſiour, and in his whole dominions there are not more than four fortified towns. The Daniſh colony, therefore, ſeems to have nothing to fear from ſuch a petty prince, who being himſelf dependant, is obliged to pay a very burthenſome tribute to the Great Mogul. Nevertheleſs, his revenues are ſo large, that in time of war he is able to levy and maintain a conſiderable army. In the laſt century, he appeared before Tranquebar with 40000 men, kept it blocked up for the ſpace of nine years, and did not withdraw his troops, until the company had ſatisfied him with a large ſum of money. The

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manner in which the diſtrict of Tranquebar paſſed into the hands of the Danes, is as little known, as are the conditions which were ſtipulated on both ſides: the journal of Ove Giedde is altogether ſilent on the ſubject; that commander contenting himſelf with ſaying, that the country was ceded to the Danes, who took poſſeſſion of it before the return of his fleet. His voyage, therefore, was not altogether fruitleſs; for he laid the foundations of a commerce, which hath continued from his time to this day.

We know not what were the funds of the company, at their firſt beginnings; but in all probability they were not very conſiderable. We have already obſerved, that by the project approved at Antwarſhau, people were permitted to have ſhares at 600 livres a piece. Such a ſubſcription could not produce large ſums; and therefore the trade at firſt could not poſſibly be carried on to advantage. We even ſee by letters and memorials written at that time, that it began to fall in a little time after its eſtabliſhment, and had well nigh been totally ruined. On the 13th of April 1622, the company preſented to the King a petition, ſetting forth the bad ſituation of their affairs; and as the firſt adventurers would advance no more money, deſiring permiſſion to admit new ſubſcribers, in the year 1633, ſome of the directors were ordered to give an account of the money which the King had advanced to the company, which (tho' that prince did all that

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lay in his power to ſupport it) ſeemed to have ſucceeded very indifferently in its enterprize. There is ſtill extant a memorial, preſented by the company, to the King at Skanderbourg, on the 12th of March 1634, in which they own themſelves indebted to his Majeſty the ſum of 624000 livres; and humbly beſeech him to remit part of the ſum.

To judge therefore from firſt appearances, a very favourable prognoſtic could not be drawn for this trade, which ſeveral people were of opinion ought to be intirely abandoned. But the rich cargoes which from time to time arrived at Copenhagen, have always reanimated their courage, and hitherto ſupported the company. Nevertheleſs, it has been long diſputed, nor is it yet in our days decided, whether the Eaſt-India trade is uſeful or prejudicial to the European ſtates by which it is carried on. The Europeans carry thither gold and ſilver in ſpecie, and the Indians keep among them theſe treaſures, which never return to Europe. Some of thoſe nations have no occaſion for foreign commodities. Others conceal below ground the gold and ſilver imported among them, either becauſe they are afraid of violence from their ſuperiors, or thro' a motive of ſuperſtition; and in this manner it is often intirely loſt. For theſe reaſons St. Evremont, in his ingenious comedy, intituled, *Sir Politix*, conſiders the earth as an animal, incommoded with obſtructions, of which ſhe cannot be delivered

livered without the aſſiſtance of a glyſter adminiſtred at Indoſtan, to give a natural motion to the riches which are buried in her entrails. Several politicians are of opinion, that the ſtates of Europe are prejudiced by the Eaſt-India trade which they carry on; and this opinion hath been canvaſſed in a great number of works. That which in the laſt century appeared in England, under the title of *The deſtruction of the trade of England by the trade to the Eaſt-Indies*, is one of the moſt judicious of theſe performances. Nevertheleſs, if we duly conſider the matter, that trade is always advantageous to thoſe people who can carry it on ſo as by the ſale of their merchandize, to draw from their neighbours as much money as they have ſent to India. For, in this caſe they ſave the money which they formerly employed in buying proviſions at the ſecond hand: beſides, the long voyages to which it ſubjects them, furniſh their ſailors with great experience in navigation. It likewiſe produces further advantages. Many people who have undergone great reverſes of fortune, being aſhamed to remain in their own native country, embrace with pleaſure the opportunity preſented by this commerce, of removing into another world, where they may, without reproach, finiſh the reſt of their lives, or (which is often the caſe) acquire wealth enough to re-appear with honour in their native country. Young people who could not be formed to virtue and induſtry at home, have been often ſent to the Indies, from

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whence they have returned very much improved in ſobriety and diſcretion. As croſſing the line ſeems frequently to deprive reaſonable people of their underſtanding; ſo likewiſe, it hath been known to rid fools of their folly.

But let us return to the particulars of the Daniſh trade. Tho' the account which we have imparted of their ſettlement at Tranquebar, is not very extenſive, we can aſſure the reader we have paſſed over in ſilence no important fact of which it was poſſible to recover the leaſt intimation: and nothing now remains but to ſhew in what their trade conſiſts, and how it is carried on.

The Indians make no great uſe of the European commodities; ſo that no great quantity is carried either to the Daniſh colony, or to other places of trade: but as iron is that for which they have moſt occaſion, it is the merchandiſe which is chiefly carried thither. The reſt of the commerce is almoſt wholly carried on with ready money or ingots of ſilver. What the Daniſh colony chiefly affords, is a large quantity of thoſe cotton ſtuffs which are uſually called Indian and Perſian; Tranquebar being the place where they are made better, and in larger quantity than in any other part of the coaſt of Coromandel. The other merchandize which the company's ſhips bring to Europe, conſiſts in muſlins, pepper, ſalt-petre, and ſeveral other pro-

ductions and manufactures of Bengal and China, which the Daniſh merchants buy from European ſhips which return from theſe latitudes. This is now the ſubſtance of the Daniſh trade to the Eaſt-Indies, tho' it was formerly more conſiderable; for beſides Tranquebar, they had likewiſe ſettlements at Bengal, Surat in Perſia, and other eaſtern countries; but the company was obliged to abandon them, in conſequence of unfavourable circumſtances.

The Kings of Denmark, however, have neglected nothing to ſupport and encourage this company. Chriſtian V. on the 29th of October 1698, granted to it, privileges which have been ſince extended by Frederick IV. the edict in which they are inſerted containing fourteen articles.

By the firſt, the company is allowed to conclude, in the name of the King, alliances and treaties with the Eaſt-Indian Princes, and even to make war upon them, if the circumſtances ſhould require ſuch extremity; but they are forbid to decide upon objects that may concern the States of Europe, in which caſes they ſhall be bound to ſubmit to the will and deciſion of the King. He moreover grants them permiſſion to build forts, and eſtabliſh factories, whereſoever the advantage of the trade ſhall require them.

The ſecond reſerves to the King the property of the fort of Danſbourg, and the fortreſs of Tranquebar; but allows the company to chooſe, by plurality of voices, the commandant and vice-commandant of them, among the directors and principal proprietors, on condition, nevertheleſs, that the King ſhall confirm the election, and an oath of fidelity be adminiſtred by the directors to the commandant ſo nominated.

The third prohibits not only the commandant and vice-commandant, but likewiſe all the members of the privy council, from carrying on the leaſt traffick; ordaining them to be ſatisfied with their appointments, and, in their direction of the trade, to have nothing but the good of the company in view.

The fourth grants to the company all the revenues of the fort of Danſbourg and fortreſs of Tranquebar; on condition, however, that they ſhall, at their own expence, maintain the neceſſary garriſons, which, beſides a certain number of Moors, ſhall always conſiſt of 200 Europeans; and that they ſhall pay the ſum ſtipulated to the Naick, or King of Tanſiour.

By the fifth, all the ſubjects of the crown of Denmark, are forbid, on pain of confiſcation of ſhip and cargo, to trade to the Eaſt-Indies: by this

this article the privilege of the company is become excluſive, tho' on condition that all the merchandize ſhall be brought to Copenhagen. This article was afterwards extended: for, at preſent, the company has permiſſion to unload their ſhips in the out-ports of the kingdom, or its depending principalities.

The ſixth article exempts the ſhips and effects of the company from all embargo; and at the ſame time promiſes, that the government will never make uſe of the company's ſhips, either in time of peace or war. To this article the King afterwards added a favourable clauſe, importing, that except the ſum which the company ſhall give in return for theſe privileges, their ſhips and effects ſhall be exempted from all civil charge; and that of all the ſums advanced to the company by ſtrangers, the government will never take the ſixth or the tenth penny. This laſt prerogative was granted with a view to augment the number of adventurers.

It is afterwards ſpecified, that the proprietors who have voices in the aſſemblies, ſhall have the right of chooſing the directors of the company; that the power of theſe directors ſhall extend to all clerks, agents, and officers in Europe, as well as in India; that the regulation of all the expence ſhall depend upon the ſame directors; that the company ſhall have its own peculiar court of juſtice, where the directors and

proprietors choſen to be aſſeſſors, ſhall judge and decide in all its affairs; and that no appeal ſhall lie from their ſentence, unleſs in caſes of life or honour. All theſe points are contained in the eighth, ninth, and tenth articles.

In return for theſe privileges, the company engages to deliver to the King's arſenal 100000 weight of ſalt-petre, or for each quintal, eight rix-dollars in ready money, as often as a ſhip ſhall arrive from the Indies, the cargo of which, when publickly ſold, ſhall amount to 150000 rix-dollars; but when the price of the cargo is under that ſum, the company ſhall pay nothing.

To give a compleat idea of the form of government, and power of the company, we have but very little to add to the contents of this edict, of which we have given the extract. Beſides the council at Copenhagen, compoſed of directors, there is another at Tranquebar, called the privy-council, compoſed of the commandant and three or four aſſeſſors, the principal office of which is to have an eye upon every thing that may contribute to the advancement of the trade. There is, beſides, at Tranquebar, a chamber or court of juſtice, which decides in litigious affairs: the preſident is always one of the members of the privy council, nominated by the commandant, and from this court an appeal lies to the company's tribunal at Copenhagen.

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If we except the King now reigning, and Chriſtian IV. none of the Kings of Denmark have had the proſperity of this company more at heart than Frederick IV. That worthy prince having heard the complaints that were made of the bad condition of the Eaſt-Indian trade, named commiſſaries to examine the cauſe of this decline of the company, and to enquire into the ſureſt means for putting it in a more flouriſhing ſituation. The reſult of this commiſſion, was, that in the year 1728, the King permitted the company to make a new aſſociation, in order to augment the number of the proprietors: the nature of which aſſociation was this.

Long experience had taught the company, that its weakneſs, which daily increaſed, was a neceſſary conſequence of the inſufficiency of thoſe funds which the firſt proprietors had advanced. Scarcity of money had obliged the company to abandon ſeveral ſettlements, together with the trade which they had formerly in China, on the coaſt of Coromandel, and at Bengal. This bad ſituation determined the directors, in the year 1728, to think of means for augmenting the company's ſtock; and to propoſe to ſtrangers as well as natives advantageous conditions, on which they ſhould be allowed to ſhare in the trade. Theſe conditions were; that the new proprietors, who were natives, ſhould pay their money into the com-

pany's bank; that the ſtrangers ſhould depoſite their's in the bank of Hamburgh, on account of the company, which ſhould deliver to each a bond or obligation, in which the number of actions bought, or the ſum paid, ſhould be exactly ſpecified; and that each proprietor ſhould be acknowledged as a member of the company, and partake of all the prerogatives granted to it by his Majeſty's royal favour. The price of actions was likewiſe fixed at 1000, or at leaſt 500 rix dollars, in ſpecie or bank notes. The new ſtock-holders were alſo indulged in the liberty of paying only one-fifth at the time of purchaſing, and of advancing the other four-fifths from four months to four months, in caſe the directors ſhould think proper: but, at the ſame time, the company reſerved the right of confiſcating, for its own profit, the payments already made, provided the remainder ſhould not be advanced at the appointed time.

But all theſe diſpoſitions came to nothing: the projected aſſociation did not take place; and the directors of the company, being unable to reeſtabliſh their affairs, ſaw themſelves at laſt obliged, on the 28th of April 1729, to renounce their whole Eaſt-India trade. This their renunciation would have totally ruined the trade of Denmark, if that ſame year ſome inhabitants of Copenhagen had not formed a new ſociety, with a deſign to retrieve it. Their zeal was ſeconded by Frederick IV. who granted to them a charter, by

by which they were, for a certain time, put in poſſeſſion of all the rights and prerogatives which the firſt company had enjoyed. They ſent ſhips to the Eaſt-Indies in the years 1729, 1730, and 1731, and traded to advantage, not only at Tranquebar, but alſo at Canton in China. In time they admitted into their aſſociation ſeveral perſons of all ranks, and exerted themſelves with all poſſible diligence and eagerneſs in raiſing their Aſiatic trade to a flouriſhing condition. They afterwards aſſumed the name of the Royal Daniſh Company, and united together for the term of forty years. Chriſtian VI. of glorious memory, confirmed this union, and granted them divers particular advantages, in a charter ſigned at Friedrechſberg on the 12th of April 1732. This new company was from the beginning divided into four hundred actions, and at firſt no more than two hundred and fifty rix-dollars of each action was paid. The produce of this payment was divided into two unequal parts: the ſtrongeſt being employed in purchaſing every thing that belonged to the old company, in India as well as at Copenhagen; namely, all its houſes, magazines, ports, places, inſtruments and utenſils, neceſſary for the ſupport of the manufactures eſtabliſhed in the Indies, and formed the Conſtant Fund of the company; the other ſerved to fit out ſhips, and purchaſe merchandize, and was called the Circulating Fund.

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The trade of this new company daily proſpering, they were ſoon in a condition to equip ſeveral ſhips, and upon this occaſion they formed new regulations. On the 22d of April in the year 1744, it was reſolved, in a general aſſembly of the proprietors, that each action ſhould be divided into four, and that henceforward the company ſhould be formed of ſixteen hundred actions; that in the aſſemblies, each owner of one action ſhould have one vote; that an owner of three actions ſhould have two votes; the proprietor of five ſhould have three; of eight, four; of twelve, ſix; of ſixteen, eight; and of twenty, twelve; and that no perſon ſhould have more than twelve votes, whatever number of actions he might own. This company has five directors, and of their number is the preſident of the aſſemblies, who is always a man of condition; one of them is a lawyer, and the other three are merchants, and each of them enjoys a ſalary of 500 rix-dollars; but in order to engage them for their own intereſt to encourage and ſupport the trade, it is regulated, that if in one year no ſhip arrives from the Eaſt-Indies, they ſhall touch no ſalary for that year. There are likewiſe five proprietors, principal ſharers, two of whom muſt be learned in the law, and well ſkilled in navigation; the three others are merchants, and all together are obliged to reſide at Copenhagen; their ſalaries are 100 rix-dollars each, and they are ſubject to the ſame law as the directors; which

which law being prudently conceived, is doubtleſs not the leaſt effectual cauſe of the ſucceſs that attends the royal company of the Indies.

Having now given a ſufficient idea of the trade of the Eaſt-India Company eſtabliſhed at Copenhagen, we proceed to conſider the commerce of the Danes on the Coaſt of Guiney.

During the reign of Frederick III. ſome Danes ſettled in the Kingdom of Acara, and formed a company which ſubſiſted ſeveral years. Two years after this eſtabliſhment, the Swedes following their example, built, with the conſent of the King of Tetu, a fort near the Cape, which they called Charleſburg, of which Iſaac Muilh, a native of Switzerland, was the firſt governor. But in the war which broke out ſoon after between Denmark and Sweden, the famous Henry Carlof took Charleſburg, and put the Danes in poſſeſſion of it. At laſt a peace was concluded at Copenhagen in the year 1660, by which the Swedes ceded to the Danes all the trade to the Coaſt of Guiney. By theſe means, the latter remained maſters of the fort, though not for long a time; for Samuel Smith, to whom they had given the command, perfidiouſly ſold it to the Dutch for a conſiderable ſum of money: neither did they enjoy a long time the fruits of Smith's treachery; they had not poſſeſſed it one month, when the inhabitants of the country made themſelves maſters of it, and reſtored it to the Swedes, who had

had founded it. Being new re-inſtated in their antient rights, the Swedes gave the government of that place to Anthony Voſt of Hamburgh; but they kept it only till the year 1663: the natives of the country attacked it again, and having conquered it, ſurrendered the fort to the Dutch, who were at that time maſters of almoſt all the Coaſt of Guiney.

During theſe tranſactions, that is to ſay, in the year 1659, the Daniſh Governor, John Cramer, had built Fort Fredericſberg, within cannon-ſhot of Cabo-Corſo. When, therefore, the Dutch were in poſſeſſion of Charleſburg, they were uneaſy at the neighbourhood of Fredericſberg, and reſolved to attack it without delay. They ſurpriſed the Danes in their houſes, treated them with great ſeverity, and laid ſiege to Frederickſberg; but juſt as they were ready to give the aſſault, which the garriſon was in no condition to withſtand, an Engliſh fleet appeared, compoſed of thirteen ſhips of war, the admiral of which, Robert Holmes, gave the beſieged to underſtand, that by virtue of a treaty between England and Denmark, he had orders to aſſiſt the Danes. This declaration changed the face of affairs: the Dutch were attacked in their turn: the Engliſh and Danes united their forces to take Cabo-Corſo, which was immediately beſieged by ſea and land. The cannon of Fredericſberg being better ſerved than before, fired ſo briſkly, that the governor, Tobias Penſade, was obliged to capitulate the third

third of May 1664; and thus Cabo-Corſo, after having been in poſſeſſion of ſeveral maſters in a very few years, fell into the hands of the Engliſh. The Danes remained at Fredericſberg till 1683, when the governor John Lycke, of his own proper authority, and conſequently illegally, mortgaged it to the Engliſh at Cabo-Corſo.

The ſecond fort which the Danes built in the Kingdom of Acara, was Chriſtianſburg, the deſtiny of which was almoſt as extraordinary as that of Frederickberg. Until the year 1659 it conſiſted of a few houſes inhabited by ſome Danes, but at that time the governor of Frederickberg began to fortify it. Nevertheleſs, Chriſtianſburg did not deſerve the name of a fort till the year 1661, when the Daniſh company ſent thither Chriſtian Corneliſen, who finiſhed all the works of the fortification. Tilleman informs us, that notwithſtanding the cabals of his ſecret and declared enemies, Corneliſen ſerved the company with great zeal during ſix years that he commanded at Chriſtianſburg. The Africans paid him infinite reſpect, on account of the great humanity and wonderful politeneſs which were remarkable in all his actions. The King of Acara had the greateſt eſteem for him imaginable. The day on which he embarked in order to return to Denmark, that Prince, together with his wives, came to take leave of him, and advanced much nearer the ſhore than is uſually practiſed on like occaſions. He appeared extremely afflicted at his

his departure; and as the cuſtom of the country did not permit him to advance to the extremity of the beach, he ordered his wives, counſellors and muſicians to accompany the Daniſh commander. Moreover, Tilleman adds, that ſeveral negroes, in order to honour his memory, took the name of Corneleſſi, that is to ſay, children of Cornelius; a circumſtance ſufficient to give us a very high idea of the virtue and probity of that man.

Chriſtianſburg remained under the dominion of the Danes till 1679, at which time the merchant Peter Bolt, who commanded there, betrayed the company, and ſold the fort to the Portugueſe, for thirty-ſix pounds of gold. In the year 1683, the Portugueſe, by order of their King, abandoned this fort, and reinſtated the Danes in poſſeſſion of a place, to which they had ſo lawful a claim. In the year 1691, the famous merchant and counſellor of commerce Nicholas Janſen Arv, undertook the command of this fort, the works of which he repaired. He likewiſe provided the moſt neceſſary ſtores; but in 1693, the inhabitants of Quambu reduced it, with the permiſſion of King Barſiar. It was ranſomed the year following for a conſiderable ſum of money, and ſince that time, the Danes have poſſeſſed it without any moleſtation. This place depends upon the company trading to the Weſt-Indies and to Guiney, which obtained the firſt confirmation of their privileges from Frederick III. in the year

year 1659. William Boſman, in his Voyage to Guiney, gives the following deſcription of Chriſtianſburg; "This fort, in itſelf, is as good "as that of the Engliſh: it is almoſt ſquare, "with four batteries; it has a very fine appear-"ance, and, we may ſay, the whole fort is but "one continued battery; for being flat on the "top, and built upon ſtrong vaults, cannon "may be planted in every part of it." We ſhall only add, that the plan of Chriſtianſburg is to be ſeen on a medal which was ſtruck in the year 1688, and is preſerved in the cabinet of the King of Denmark.

It is certain, that while the inhabitants of Guiney remained ignorant of the value of gold, the commerce carried on with them was of very great importance: but at preſent, they handle the ſcales with as much dexterity as the moſt cunning Europeans. Tilleman informs us, that in his time, half an ounce of gold was purchaſed for eight rix-dollars, and that, in commerce, it was worth no more. The merchants therefore in Guiney, gain only upon the goods they ſell, and not upon the gold they buy: beſides, it is a common practice in that country to adulterate the gold. The negroes have the ſecret of making, by alloys, two ounces of one ounce of gold; by which means the Europeans, who are not maſters of the art of eſſaying, are very often deceived.

The greateſt quantity of gold on the coaſt of Guiney, comes from the kingdom of Acania, which

which is looked upon as the moſt extenſive of all the neighbouring ſtates. The ſlaves dig up the earth, with which the gold is mixed like duſt, or very fine ſand: ſometimes, likewiſe, they find lingots of a conſiderable ſize. With this mixture of earth and gold duſt they fill wooden bowls, which are expoſed to the ſun, ſo that the ſcorching rays in a ſhort time dry the earth, and render it more eaſy to diſſolve in water. In effect, when water is poured into the bowls, it carries off all the earthy particles, and leaves at the bottom the grains of gold, and ſmall ſtones or pebbles, the weight of which prevents them from being ſwept off with the earth. This operation being performed, theſe ſlaves carry the gold duſt to their chief, whom they call Bomba: he is the perſon who puts the laſt hand to the work, and who, by means of a copper ſieve, ſome ſmall baſons, and by blowing, finiſhes the purification of the gold. It is imagined, with great probability, that the inhabitants of Guiney might find in their country treaſures of immenſe value, if they had the leaſt knowledge of the art of mining; but they are ſatisfied with ſeeking for gold duſt with the ſhovel, by digging the earth at random, without the leaſt art. We might conjecture from hence, that they are not very artful in commerce, and that it would be an eaſy matter to impoſe upon them; but, beſides what we have already obſerved on this ſubject, John Muller informs us, that even in his time the negroes were ſo well inſtructed, that it was not poſſible to ſell them

Dutch

Dutch cloth for Engliſh cloth; and that they diſtinguiſhed the one from the other by the colour. Moreover, he adds, that they diſcerned perfectly well between Eaſt-India goods, and thoſe that were counterfeited in Europe.

If the commerce of the Coaſt of Guiney is not ſo lucrative as formerly, the principal reaſon is, that the Europeans carry thither too great a quantity of merchandize. In 1669 there arrived more than fourteen veſſels, deeply loaded, at the fortreſs of Chriſtianſburg, which is at preſent the only place in Guiney belonging to the Danes. The company maintains there a governor, a factor, a ſecretary, ſome writers, and a garriſon conſiſting of twenty men, without including the officers: the three firſt conduct the commerce, in the name and on behalf of the company. The principal goods that are exported thither, are, ſpirits, gunpowder, guns, tallow, all ſorts of woollen and Eaſt-India ſtuffs. In exchange for theſe, the inhabitants of Guiney give gold, ſlaves, all ſorts of proviſion for the garriſon, and ivory. When the markets are made, the Daniſh veſſels deſtined for the Weſt-Indies, take on board as many ſlaves as they can hold, whom they tranſport to the colonies belonging to their company; but the gold and ivory are ſent on board the ſhips that return to Copenhagen.

It appears, by a petition preſented to the King the 29th of April 1675, that it was in the reign

of

of Frederick III. the Danes formed a ſcheme of extending their commerce to the Weſt-Indies, and that this Prince granted permiſſion to a ſhip-maſter named Eric to trade in the iſland of St. Thomas. It is commonly believed, that this navigator died and was buried there. This firſt eſſay, however, did not ſucceed; for we perceive, by a declaration of Chriſtian V. ſigned the 11th of March 1671, that we muſt place the epocha of the commerce to St. Thomas in the year when this declaration was iſſued. The royal edict which we have juſt mentioned, grants a permiſſion to form a company for carrying on the trade to America. The firſt directors publiſhed, on the ſixteenth of the ſame month, a declaration, wherein they explained the manner in which the commerce was to be conducted. All ſorts of perſons, without any diſtinction, were allowed to become proprietors, and the ſmalleſt ſtock was fixed at an hundred crowns. Finally, this declaration imported, that the trade ſhould be directed by ſix proprietors, each of whom ſhould be poſſeſſed of ſtock in the company to the value of 2000 rix-dollars.

In 1672 the Danes got full poſſeſſion of the iſland of St. Thomas, in the following manner: Hitherto that iſland had belonged to the Engliſh; but Mark Goce, miniſter to the King of Denmark, having prevailed upon the Engliſh King to cede it to the Daniſh company, Stapleton, who commanded for the Engliſh, had orders to abandon

abandon it. The inſtructions ſent him for that purpoſe, among other things, imported, that after he ſhould have evacuated the iſland, it ſhould become the property of the firſt poſſeſſor. In conſequence of this order, the Engliſh deſtroyed their houſes and magazines, and abandoned the iſland, which was no ſooner done than the Danes took poſſeſſion. Their principal right conſiſts in this ceſſion; and in the protocol of the Weſt-India company, we find a tranſlation, into the Daniſh language, of the order that was ſent to Stapleton. Since that time, the Spaniards are the only perſons who reclaim that iſland of the Danes, alledging for their reaſon, that it is ſituated upon the coaſt of Yucatan or Campeachy. We learn this circumſtance from a petition preſented to Chriſtian V, ſigned by Peter Peterſon Lerck, and John Nanſen. They beſeeech his Majeſty to uſe his intereſt with the Queen of Spain in their behalf, to intreat that princeſs to deſiſt from her pretenſions, and at the ſame time to repreſent to her, that the Danes poſſeſſed St. Thomas with as much juſtice as the Engliſh had done before them. This is all we have been able to diſcover touching the origin of their commerce to that iſland.

When the Danes were firmly eſtabliſhed in the iſland of St. Thomas, and the poſſeſſion of it no longer conteſted, the Elector of Brandenburgh had a mind to embark in the trade of the company. It was with this deſign that ſome Brandenburghers went to ſettle at St. Thomas; but

they acted in every thing with such indifference, that they scarce deserved the name of parties concerned. At length, the time for which they were received into the company being expired, the King of Prussia, Elector of Brandenburgh, proposed to prolong the term; but as the Brandenburghers already owed a considerable sum to the Danes, and there was no appearance of the company's being reimbursed, they rejected those propósals, and confined their views to the resources which they might find in the dominions of Denmark. In a declaration signed at Copenhagen on the 19th of April 1686, every subject of the King was permitted to trade in the island of St. Thomas, on condition, always of transporting the merchandize in bottoms belonging to the company, to which, however, he should pay but very moderate freight. The same declaration granted to all the inhabitants of Copenhagen, Bergen and Christian-sands in Norway, the liberty of trading in the West-Indies during six years with their own ships, and favoured them with all the privileges of the company. At the same time it was fixed, that the term of these six years should begin at the date of this declaration, and that each private person, desirous of profiting by it, should pay to the company an acknowledgment, to be agreed upon beforehand with the directors. With regard to the company itself, this declaration imported, that none of those who were proprietors for less than 500 common crowns, should be able to acquire

quire one or more lesser portions in the company; that in order to avoid all that disorder which usually results from small and unequal sums, every member should be bound to round the sums which he either had advanced, or should advance for the trade of the company; and that this should be done in ready money, and not by purchasing actions from another; that is, that those, who being proprietors for one or more hundred crowns, and had occasion to advance 20, 30, or 40 more, should be obliged to do it in a round sum, by furnishing what remains to make up the hundred that is begun; and that in case of refusal, that advance should be adjudged to him who would supply the deficiency of the hundred, or even to the company; that in the company's assemblies, none should have votes but those who have embarked to the amount of 500 crowns, and that the rest should acquiesce in every thing which the first shall decide by a plurality of votes.

This regulation shews, that the first stock of this company was not very considerable. By advancing five hundred common crowns, a man became one of its principal proprietors. Besides, by a moderate acknowledgment, every merchant obtained liberty to trade to St. Thomas. It is not well known for what reasons the cities of Copenhagen, Bergen and Christian-sands obtained the privilege of carrying on this trade in their own bottoms; perhaps these were the only towns that demanded it; or, in all likelihood, it was

 believed

believed that the two firſt were the moſt capable to undertake ſomething with ſucceſs; and as Chriſtian-ſands was a town newly built, it was perhaps thought proper to encourage the inhabitants with ſuch privileges. Be that as it may, this indulgence plainly ſhews, that the trade of the Weſt-Indies was not at that time very flouriſhing, and that the company conſented to theſe ſorts of permiſſions, only with a view to gain time for putting itſelf in a condition to carry on the trade excluſive of all others.

Under the name of St. Thomas are alſo comprehended St. John, and ſome others of the Caribbee Iſlands. The company there maintains a commandant, a vice-commandant, a factor, a caſhier, a ſecretary, and a garriſon of one hundred men. Thither they tranſport all ſorts of merchandize manufactured in Europe and the Weſt-Indies, which are ſent under the name of the Weſt-Indian cargo: thither, likewiſe, they tranſport a good number of negroes, whom the inhabitants purchaſe to employ in their plantations. They have returns of ſeveral ſorts of fruit, which grow in theſe iſlands, or other parts of the Weſt-Indies; as ſugar, cotton, hides, indigo, turtle, tobacco, and all ſorts of wood for dying.

Beſides this iſland, a new privilege unites the property of the ſugar-refining work to the other poſſeſſions of the company. At firſt there were only

only ſome members of this ſociety who had advanced money for the eſtabliſhment of that refining work, and by whom it was of courſe ſeparately governed; but, at preſent, it is entirely under the direction of the Weſt-India company; and ſince that time, every action is worth 500 rix-dollars. On the 11th of June 1747, the nnmber of theſe actions was augmented by the admiſſion of ſome new proprietors; at preſent they amount to 1250; and each action being worth 500 rix-dollars, the ſtock of the company amounts to 625000 rix-dollars. The company actually pays to the proprietors an intereſt of five per cent. upon the new actions, and ſeven per cent. upon the old, as well as on thoſe that are founded upon the ſugar-refining work, the number of which is 250. In conſequence of a diſpoſition publiſhed on the 6th of February 1747, every action advances for what is called the circulating ſtock, and according to the repartition made to the company, as much as is neceſſary for the building, equipment and cargo of the ſhips; and the company gives to each proprietor a receipt for his contingent until the ſhips return, and they can make a dividend of the profit reſulting to the aſſociates.

Before we ſpeak of the company formed in our days at Bergen in Norway, for trading to Greenland, that country having been entirely abandoned for upwards of one hundred years, it will be neceſſary to review the firſt origin of that com-

merce. What we are going to ſay upon the ſubject, will ſhew, at the ſame time, what the reaſons are which the Danes may, and actually do alledge, for excluding all other nations from the poſſeſſion of the coaſt of Greenland, and the trade there carried on; and without entering into any diſcuſſion, or pretending to decide upon the matter, we ſhall content ourſelves with relating what we find recorded in hiſtory.

A Norwegian gentleman called Torwald, having committed a murder in his own country, was obliged, together with his ſon, to take refuge in Iceland, where he died. His ſon Eric Torwaldſon, being afterwards guilty of the ſame crime which his father had committed, was, like him, conſtrained to betake himſelf to flight; but where to go he knew not. At length, he reſolved to attempt the diſcovery of a country, which, according to the report of one called Gund Bioern, was ſituated to the north-weſt of Iceland. He accordingly undertook the voyage in 982, and at firſt arrived at an iſland ſituated at a ſmall diſtance from a ſtrait, to which he gave the name of Erich-ſund, that is, the ſtrait of Erich. After having paſſed the winter in this iſland, he tranſported himſelf in the ſpring to the Continent, and finding the country green and pleaſant, beſtowed upon it the name of Groenland, or Greenland, which it preſerves to this day; and the ſpot where he landed was called Erichfiord. Erich-Roth-kopf having ſpent ſeveral years, ſometimes upon

upon the Continent, and ſometimes in the iſland, reſolved to return to Iceland, to perſuade the inhabitants, with whom he had found means to reconcile himſelf, to follow him to Greenland. The magnificent deſcription he gave them of the fine paſturage, the great quantity of game, and the number of lakes filled with fiſh, to be found in this new country, diſpoſed them in his favour, and they followed him thither in great numbers. Some years afterwards, his ſon Leiff-Erichſon, that is, the ſon of Erich, went to Norway, which was then governed by Olaf-Truggeſoen; and that prince, charmed with his deſcription of Greenland, reſolved to make himſelf maſter of it; but, as he had embraced Chriſtianity, he perſuaded Leiff-Erichſon to renounce his ſuperſtition and be baptized, and to paſs the winter at his court. In the ſpring he ſent him back to his own country, accompanied by ſome Norwegians, and a prieſt to convert his father Erich, and thoſe that were with him. The father was at firſt very much diſpleaſed with his ſon, for having brought ſtrangers into the country, and taught them how to become his maſters; but the ſon uſed ſuch powerful arguments, as at length not only appeaſed, but alſo perſuaded him to be baptized, with all his people. In an hiſtory of Denmark, written in verſe, this expedition is ſaid to have happened in the year 770; but Snorro-Sturleſoen, in his hiſtory of Iceland, brings it down to the year 982, which falls about the reign of Olaf-Truggeſoen.

This

This is the firſt æra of the trade which was afterwards carried on in Greenland. As the inhabitants multiplied, they extended themſelves in the country; they diſcovered between the mountains ſeveral fertile vallies, and divided Greenland into eaſt and weſt. In the firſt they built a town, which they called Garde, whither the Norwegians repaired yearly to trade. In proceſs of time, they built another town, which was called Albe; and at a ſmall diſtance from the coaſt, founded a convent in honour of St. Thomas. In the ſequel, the city of Garde was the ordinary ſee of the biſhops, and the church of St. Nicholas the metropolitan of Greenland. Jonas Arngrim, an Iceland hiſtorian, has given us a liſt of the biſhops of Greenland; and Huitfeld, in his hiſtory of Denmark, ſays, that in the year 1389 a biſhop of Greenland aſſiſted at a council then held at Nubourg in the iſle of Fyen. Theſe biſhops were, in ſpiritual affairs, ſubject to the archbiſhops of Drontheim, and with regard to temporalities, depended upon the kings of Norway, who judged them by their governors, according to the laws of Iceland. The hiſtory of Denmark relates, that in the year 1256 the Greenlanders revolted againſt Norway, where Magnus at that time reigned; but that prince reduced them to obedience, by means of the ſuccours lent to him by Erich King of Denmark, and peace was concluded with them in the year 1261. Arngrim names the three chiefs of the country by

whom it was ſigned. By this treaty, the Greenlanders engaged anew to pay an annual tribute to the King of Norway, and this tribute was appropriated to the maintenance of the King's table.

What we have hitherto related concerning antient Greenland, is the eſſence of all that can be known with certainty of the hiſtory of that country, which ends in the year 1348, at which time a dreadful plague ſwept off a conſiderable number of Norwegians, who then compoſed the Greenland company. This fatal accident weakened the trade to ſuch a degree, that they were at laſt obliged to abandon it entirely. We find, that ſome time after the decay of this company archbiſhop Eſkild formed a project for re-eſtabliſhing the trade; and that in 1406, he ſent one called Andrew to ſucceed the laſt biſhop of Garde; but ſince that time, no account was ever received either of Andrew or the inhabitants of antient Greenland: perhaps the few who had eſcaped the plague gradually periſhed, when the Norwegians deſiſted from ſupplying them with ſeveral things neceſſary for their ſubſiſtence.

The Kingdom of Norway being afterwards united to that of Denmark, the Kings for a long time were too much embarraſſed with other affairs, to give much attention to the trade of Greenland, which ſunk inſenſibly into utter oblivion. When Erich of Pomerania ſucceeded Queen Margaret in the three Kingdoms of the

North,

North, he was altogether unacquainted with the affairs of his dominions, and had not leiſure enough even to examine whether or not there was any ſuch country in the world as Greenland. Chriſtopher of Bavaria, who came after him, was pretty much in the ſame ſituation, and peradventure never heard Greenland mentioned. Chriſtian I. being the firſt prince of the family that now reigns in Denmark, was as much involved in buſineſs as his predeceſſors. He was engaged in ſevere wars, made a journey to Rome, and, with the Emperor's conſent, undertook to reunite Dilmarſe with his crown; he took poſſeſſion of the countries of Schleſwig and Holſace, and was engroſſed by the rebellions that were raiſed againſt him in Sweden. The ſame may be ſaid of his ſucceſſor King John, who was by wars and other troubles hindered from thinking of the Greenland trade. Under the reign of Chriſtian II. Erich-Walckendorf, archbiſhop of Drontheim, attempted to re-diſcover the country which was no longer known. With this view, he collected all the old books in which it was mentioned: he made enquiry among Norwegian merchants and ſailors, who might be able to give him ſome lights about the ſubject; and in conſequence of theſe informations, cauſed a ſea-chart to be made, in which was marked the courſe to be obſerved in finding Greenland. But as that prelate was one of the partiſans of Chriſtian II. he found himſelf obliged to quit Norway when that prince left the Kingdom, and Frederick

Frederick I. aſcended the throne. Walckendorf retired to Rome, where he died; and his retreat ſtifled in the birth that company which he himſelf had formed for retrieving the trade of Greenland. Chriſtian III. was the firſt King of Denmark who thought of re-eſtabliſhing the communication with that country; but his attempts were unſucceſsful, thoſe who were ſent upon the ſearch having returned without finding it. Nevertheleſs, that prince did not deſpair of ſucceſs: he encouraged his ſubjects to attempt the diſcovery, by a declaration, allowing them to go thither without aſking permiſſion, and carry on what trade they ſhould pleaſe to follow. Norway, however, was at that time in ſuch a bad ſituation, as to be incapable of fitting out the neceſſary ſhips for ſuch an enterpriſe. Frederick II. formed the ſame project. One Magnus Henningſen, whom he ſent upon the diſcovery of this loſt country, met with a very ſingular adventure: after having undergone all ſorts of misfortune, he found himſelf ſo near a country as that he could ſee it; but, all of a ſudden, his ſhip ſtood motionleſs in the open ſea, without being able to get one fathom a-head. The whole crew were amazed at ſuch an extraordinary accident, the cauſe of which no body could diſcover. The wind was favourable, the ſhip in open ſea, and the water, which was not entirely frozen, deep enough. Henningſen, finding it impoſſible to advance, thought proper to return to Denmark, where he gave an account of this adventure to the

the King, pretending at the ſame time, that in all probability, there was a ſort of load-ſtone at the bottom of the ſea, which had attracted and detained his ſhip. We dare not, however, warrant the truth of this fact; but will paſs on to other attempts which have ſince been made for re-diſcovering this country.

That great King Chriſtian IV. was very much bent upon the execution of this project. We find in the hiſtory of that active prince, that he ſent at four different times, ſhips on the diſcovery of antient Greenland; but not one of them ſucceeded, and he found himſelf at laſt obliged to drop the deſign, eſpecially, after captain Munck had the misfortune to loſe the greater part of his ſhips, and almoſt all his people, who died of the extreme cold that prevailed on the coaſt where he ſpent the winter.

But, altho' this Prince had abandoned the ſcheme, ſome private people formed a Greenland company, in which a few perſons of diſtinction embarked. This company, in the year 1636, fitted out two ſhips, which arrived at Davis's Strait, where they came to an anchor while they remained in that place, the people of the country approached their ſhips in ſmall canoes, and offered to ſale their merchandize, which chiefly conſiſted of fox-ſkins, and other kinds of fur. Theſe they exchanged for looking-glaſſes, knives and pens, which were ſhewn to them

them by the crew. But ſcarce were they become a little familiarized with the Danes, when a cannon was fired, doubtleſs on account of ſome health that was drank on board. This noiſe affrighted the ſavages in ſuch a manner, that they plunged themſelves headlong into the ſea, and did not appear above water, until they were at the diſtance of ſome hundred paces from the ſhips. It was very difficult to allure them back again after this accident: nevertheleſs, they at laſt ſucceeded, and while this trade was carried on between them, a man who went on ſhore, made a diſcovery that overwhelmed the whole crew with joy. He perceived a ſhining mountain upon the coaſt, and approaching it, found that the ſand which compoſed it, had not only the colour, but likewiſe the weight of gold. At his return, the crew thought they had diſcovered the Peru of the North; and they would give attention to no other thing. One of the ſhips being loaded with this precious ſand, they ſet ſail for Denmark, where, when they arrived, the marſhal of the court, who was then chief of the new Greenland company, being extremely ſurpriſed at their quick return, aſked the reaſon of it, which they were not ſlow in explaining; they told him, in a tranſport of joy, that they had brought home all the treaſures of the new world. Immediately the marſhal of the court, ſent for a goldſmith of Copenhagen, and ordered him to examine the ſand which had been bought; but notwithſtanding all the methods he took, he

he could not extract from it one grain of gold. Theſe experiments being carefully compared and examined, the finder was ordered to repair on board his ſhip, which was in the North Strait, and to throw into the ſea all thoſe pretended riches he had brought home. We have thought proper to relate this adventure, becauſe the ſame ſort of ſand which was formerly found in Davis's Strait, has made abundance of noiſe after the ſettlement of the new colony of Bergen, and even in our days, people flatter themſelves that they ſhall there find mountains of gold. Such were the pains taken by the Danes, in the reign of Chriſtian IV. for rediſcovering antient Greenland; but their miſcarriage induced them to drop the deſign intirely, and at preſent it is no longer thought of; for the courſe formerly taken to ſail thither from Iceland, is now ſuppoſed to be blocked up with ice. The coaſt which is now called New Greenland, is quite different from the antient Greenland, to which as we have obſerved, the Norwegians ſent a colony. To reach New Greenland, they ſail by Cape Farewell, or Davis's Straits. It is not credible, that the Greenlanders whom Godſke Lindenau brought to Denmark, in the reign of Chriſtian IV. could be the deſcendants of the antient Norwegians. They did not reſemble that people, either in their figure, manners or language. They ſpoke a gibberiſh altogether unknown, of which no more than two words, *Oxa indecha*, could be diſtinguiſhed.

Since

Since the diſcovery of this country, ſhips have been ſent into theſe latitudes, on the whale fiſhing; but, in our days a colony has been ſettled in Davis's Straits. Of this we ſhall give a circumſtantial hiſtory, the more authentic, as the journal of the firſt miſſionary of New Greenland was in the hands of the author whom we follow in the preſent relation.

The trade to Greenland lay intirely neglected, when a miniſter in the northern parts of Norway, called Egede, rouſed the attention of the public to that branch of commerce. He addreſſed himſelf firſt to the ſeveral biſhops of Bergen, who had ſucceeded to that ſee in a very ſhort ſpace of time, and afterwards to the burghers of that city; but notwithſtanding the great zeal he manifeſted for the propagation of the goſpel, in a country where it is certain it had been already preached; and all his endeavours to inſpire the inhabitants of Bergen with the hopes of profit from that commerce, he was diſregarded both by the biſhops and burghers, who looked upon him as an idle projector. This bad ſucceſs far from diſcouraging, animated him the more to proſecute his deſign: he found means to preſent a memorial to Frederick IV. which met with ſuch a reception, that the King recommended him to the magiſtrates of Bergen, in order that he might communicate his plan to the burghers, and excite them to form a company for retriev-

ing

ing the trade to Greenland. The magiſtrates obeyed the King's orders; but all that Egede could ſay to convince them of the utility of his project, had no effect.

This miniſter, therefore, reſolved to go in perſon to Copenhagen, where he preſented another memorial to Frederick; and the monarch having approved of it, and promiſed to ſecond his enterprize, provided he could engage the city of Bergen in his intereſt; he returned immediately to that place, where he exerted himſelf ſo effectually, that the clergy and burghers conſented to contribute five thouſand rix-dollars. This firſt ſtock being afterwards augmented to 12000 rix-dollars, a Greenland company was formed, which in the year 1721 ſent out three ſhips, two of which only arrived; the third was obliged to return to Bergen, not having been able to ſurmount the difficulties of a troubleſome navigation. Of the two ſhips which arrived, that which carried Egede wintered in the country; the other returned immediately to Norway without any cargo; becauſe the little fleet had not ſailed from home till the ſeaſon was too far advanced.

A beginning ſo unſucceſsful, by which the proprietors ran the riſque of loſing the money they had advanced, would have infallibly cruſhed the company, had not the King ſupported it by impoſing a tax upon his ſubjects. This tax, how-

howſoever ſmall it was, produced a ſum ſufficient to enable the company to reſume with vigour the trade of Greenland. The miniſter Egede, with about forty men, had made a ſettlement in an iſland ſituated in the latitude of 60, oppoſite to the coaſt of Bols River. He received, the following years, all neceſſary ſuccours, and having begun to learn the language of the country, the ſweetneſs of his temper procured him the confidence and affection of the natives, whoſe character we read in his memoirs. The Greenlanders, ſays he, are honeſt, obliging and very peaceable. They have neither magiſtrates nor government, and live, properly ſpeaking, under the law of nature. In ſummer they hunt and fiſh: in winter they retire to certain places, where they conſume together the proviſions which they amaſs during the fine ſeaſon. They may be conſidered as having no religion, although at ſtated times, they perform ſome acts of devotion, and are acquainted with ſorcery and enchantments, of which they are very fond. Nevertheleſs, without any theory, they practiſe ſeveral virtues, a circumſtance not more inconceiveable than to ſee amongſt ourſelves a theory without practice. The parents love their children with great tenderneſs; love and union prevail in their marriages; they abhor polygamy; and deteſt quarrels, theft, murder and inceſt. In other reſpects they are extremely ignorant. The notion which they entertain of the moon is very ſingular. When that planet is under their horizon, they imagine

it is come down upon the earth, in order to hunt ſea-dogs, and lay up a ſtore of proviſion.

As Greenland produces nothing but graſs, and the commodities to be imported from thence conſiſt only of oil, whale-bone, unicorns horns, (an unicorn is a ſea fiſh) the ſkins of rein deers, foxes and ſea dogs, this commerce was very expenſive to the company, and moſt of the proprietors withdrew their ſtock. But the King, who looked upon this country with another eye than that of a merchant, reſolved to preſerve and cultivate this trade at his own charge. He eſtabliſhed a ſecond colony at Nepeſen, in the latitude of 66° 30′. Nevertheleſs, ſome years after, Chriſtian VI. was upon the point of abandoning Greenland; but the repreſentations of Egede warded off the blow. This miniſter had already baptized one hundred and fifty children of Greenlanders, and continued to apply to the duties of his miniſtry with indefatigable zeal. In 1733 he was diſturbed by the arrival of three of count Zinzendorf's diſciples, whoſe ſect is known by the name of Unitas Fratrum or proteſtants of Moravia. Whatever Egede might have done, certain it is he did not hinder them from making proſelytes, and erecting altar againſt altar.

The King having, in 1734, put the commerce of Greenland under the direction of a rich merchant called James Severins, this gentleman puſhed it with great vigour, and formed a third colony

colony at Cape Deſco, in the latitude of 69°; giving it the name of Chriſtianſhab, that is to ſay, Chriſtians hope. The following year, the King, with a view to favour Severins, prohibited all foreign veſſels from approaching within fifteen leagues of the Daniſh colonies. This prohibition offended the Greenlanders very much, who thought it very extraordinary that people ſhould ſo openly diſcover their avidity, and at the ſame time, be ſo very unjuſt as to envy the advantage of others. The edict, however, has ſubſiſted, notwithſtanding it appeared ſo unreaſonable in the opinion of that people: Severin's ſhips have taken ſeveral Dutch veſſels, and the trade of Greenland has become ſo flouriſhing, that in 1739 two new colonies were founded; one under the name of Frederickſhaab, and the other of Jacobs Haven. It has not, however, been poſſible hitherto, to impoſe any tribute upon the Greenlanders: whenever that ſubject is touched upon, they anſwer very naturally, that the King of Denmark being richer than they, he ought rather to give to them than receive any thing from them. The goods that are given in exchange for the commodities of that country, are ſhirts, ſtockings, knives, ſciſſars, dice, copper-kettles, wooden troughs, laths, pins, falſe pearls, and ſuch like trifles. The King has ordered the country to be viſited, in ſearch of metals or minerals, but no mines have been hitherto diſcovered.

The trade of Iceland did not coſt ſo much pains in eſtabliſhing. The Dutch, the Hamburghers, and merchants of Bremen, were the only perſons who, for a long time, traded to that iſland; but Chriſtian V. having prohibited ſtrangers from approaching it, formed himſelf a company for carrying on the commerce of that country. That company began to gather ſtrength, when the Algerines in 1627, cruiſing in theſe diſtant climates, made a deſcent upon the iſlands of Grindewig and Weſte Manoe, from whence they carried off a great number of inhabitants. Such an unforeſeen accident diſcouraged the moſt part of the proprietors, who withdrew their money. Nevertheleſs the company ſubſiſted till 1662, when the King ſuppreſſed it. This was ſucceeded by another company, formed of no more than four aſſociates, who payed four thouſand rix-dollars yearly to the government; and theſe four perſons divided the iſland into four parts. Their charter being expired in the year 1680, the trade of that iſland fell into the hands of four other merchants, with liberty to receive as many aſſociates as they ſhould think proper to admit: but they did not keep it long; it was farmed in 1684, to the higheſt bidder; it was conſtantly renewed from one term of ſix years to another, till the year 1733, when it was given to a company that ſtill ſubſiſts, and which, by different renewals of leaſes, will be in poſſeſſion of it till the year 1771, together with the trade of the Daniſh Lapland.

Lapland. The merchants of Copenhagen underfarm from the company the different ports of that iſland.

Iceland, like Norway, is mountainous and ſtony; we find from evident marks, that ſubterranean fire hath at different times changed its ſoil, and the pumice ſtones which are from time to time thrown upon the ſhore, demonſtrate that theſe burnings extend even to the bottom of the ſea. Perhaps to them the iſland owes its exiſtence, like that the formation of which is deſcribed by Moro, in his Italian work upon petrefactions. No part of Iceland is inhabited, but the ſea coaſt, and the banks of ſalt lakes, ſome of which extend ſeveral leagues from the ſea into the land. The firſt peopling of it is fixed in the year 860, and aſcribed to Nudd-Otto, a Norwegian pyrate. In the year 981 the number of families in Iceland amounted to 3800, which ſince that time has not encreaſed. As Iceland produces no corn, the merchants of Copenhagen ſend thither a great quantity for the chief men of the country: but the poorer inhabitants, in lieu of bread, eat dried fleſh and fiſh. The ſea throws upon the ſhore a kind of weed called Saul or Soel, which the poor people gather, dry and uſe inſtead of flour and bread. It is likewiſe boiled with milk, and the people are permitted by the laws of the country to give it for food to their ſervants. The leaves of this plant being preſſed for ſome time, yield a moiſture which afterwards forms a

real ſugar, and being boiled for ſome time, yield a viſcoſity of a gummy nature, which renders them a very wholeſome remedy in the bloody-flux. Iceland is ſuppoſed to have been much more fruitful of old than it is at preſent; it even appears to have produced wood in abundance; for it is often found petrified, and large diſtricts are full of deep roots; but in theſe days it bears neither corn nor trees. Nevertheleſs, the floods of ice which the ſea conveys thither in the ſpring, ſometimes bring along with them, trees which the iſlanders uſe for building and firewood: though for this laſt purpoſe they commonly make uſe of turf. When the ice comes from the northward, the inhabitants run in crouds not only in ſearch of wood, but likewiſe to take the bears, wolves and foxes which have been ſurprized upon the ice by a ſudden thaw, and carried away upon the floats. The good paſturage which Iceland produces, makes amends in ſome manner, for the univerſal dearth of wood and corn. By means of this paſture the iſland becomes rich in cattle, milk and butter. As yet they have found no marks of any metal, but alum is very common about the warm baths. There is pit-coal in ſeveral places, and among the ſtones there found, one called Rofetenna, of a black colour, and as hard as a diamond. Several rivers abound with ſulphur, plenty of which is alſo thrown up by Mount Hecla, and is part of the lading of thoſe ſhips which trade in the ports that are neareſt to the mountain. The

faulcons of Iceland are in great reputation. When the inhabitants catch them, they are carried to the King's faulconers, who, in proportion to the beauty of each bird, pay from five to fifteen rix-dollars; as to the white faulcons, the price of them is fixed at fifteen rix-dollars, and they are reſerved for preſents which the King makes to other crowned heads of Europe. Some years a ſingle ſhip has been known to bring over upwards of 120 faulcons, which might form a trade with thoſe foreign countries where they are moſt eſteemed. Theſe birds are taken in nets, and other birds uſed to decoy them, namely thoſe called Rypen.

The merchants of Copenhagen have built ſeveral houſes or magazines, near the ports which they farm; the number of theſe ports is four and twenty; in ſeventeen they load with fiſh, and in the other ſeven with fleſh. Iceland is ſurrounded with ſeveral ſmall iſlands, of which Weſt-Manoe is the moſt conſiderable, having a trading port. The ſhips of Copenhagen, which go to Iceland to fiſh, uſually reach it in the month of May or June, and return in the month of Auguſt. Thoſe which go for beef, uſually arrive and return a month later. Strangers are forbid to trade in Iceland, on pain of confiſcation of ſhip and cargo. Thoſe cuſtom-houſe officers who in this particular preſume to defraud the King of his right, loſe their employments and effects, and in certain caſes, are even

condemned to ſlavery. In ſpite of theſe prohibitions, a clandeſtine trade is carried on, by the Engliſh and Dutch, and ſometimes by the ſhips of Bayonne and Biſcay, on pretence of going thither on the whale-fiſhing. The imports of Iceland are meal, iron, copper, ſalt, wine, brandy, metheglin, beer, tobacco, broad-cloth, linnen, all ſorts of inſtruments and utenſils uſed in fiſhing; and all kinds of iron utenſils and carpenters work, &c. the exports are dried fiſh, whale oil, cod, ſtockings, down, beef, mutton, ſheep-ſkins, ſuet, butter, wool, ſulphur, &c. So that while care is taken to exclude ſtrangers from Iceland, the Danes will always find the trade of it too advantageous to be dropped.

REFLECTIONS on the means for diſcovering MINES, and the precautions to be obſerved in opening them, together with the advantages that reſult from them.

IT would be eaſy to prove, that men worked at mines before the deluge, and that ſince the renovation of the human race, this art was one of the firſt they cultivated. We might ſhew how the Iberians, who made ſuch a figure in antiquity by the ſucceſs of their works, ſent colonies to the weſt and north, to open in Spain and Sweden mines abounding with the moſt neceſſary metals. But as it would be unſuitable to the nature of our journal to aſſume the voice of hiſtory, it will be ſufficient to remark, that the deſire of tearing from the entrails of the earth the riches they conceal, and the neceſſity of drawing from them the matter of which the inſtruments of all arts are made, have not allowed mankind to diſcontinue thoſe tedious and painful reſearches. The Germans learned them of the Swedes, whom they candidly own for their maſters, confeſſing that almoſt all the terms of that art belong to the Swediſh tongue, or are derived from it. Theſe laborious diſciples are, in their turn, become the maſters of Europe: we find no other people ſo profoundly ſkilled in mines, and no workmen

workmen ſo dextrous in extracting and ſmelting the ore. They owe this inconteſtable ſuperiority not only to their natural perſeverance, but ſtill more to the perfect liberty they enjoy on this ſubject. Chemiſtry is not decried in Germany, as in the other parts of Europe: petty princes and noblemen apply themſelves to it, as well as private perſons; they aſſociate with one another, and mutually communicate their improvements and experience. By ſuch happy concert they have explained the theory of the moſt obſcure of all the ſciences, and brought the practice of the moſt difficult art to perfection. The fruits they have reaped from their induſtry are far from being contemptible: in digging the earth they have given value to a diſtrict, which otherwiſe would have produced little or nothing. They employ an infinite number of workmen, artiſans and virtuoſi. The ſale of metals and minerals, and the proviſion neceſſarily conſumed by all thoſe who work at them, occaſion an eaſy circulation of the money of the country, and bring more from foreigners who have occaſion for thoſe commodities. Finally, the revenues of the prince are naturally augmented, not only by the taxes levied upon his ſubjects and their proviſion, but likewiſe by thoſe rights of ſovereignty which he has over the mines themſelves.

The moſt certain lights, therefore, which we can obtain in the knowledge of mines (which is too much neglected in France) and the moſt ſtriking

ing examples of their utility, are to be derived chiefly from the German nation; and we flatter ourſelves that we ſhall do an eſſential ſervice to the public, as often as we communicate the moſt valuable ſentiments of the Germans on this ſubject. The ſpecimen which we now preſent, ought to be conſidered as an introduction to the ſcience of mines; and we exhibit it with a view to diſpoſe the minds of our readers to receive favourably thoſe others we have in our hands, and which we ſhall publiſh in the ſequel.

Of all the enterpriſes in which the hope of conſiderable advantage engages mankind, there is none by which they are more often deceived than that of mines; for not only the mine, which was ſuppoſed to be rich, turns out very poor, but the works abſolutely neceſſary for putting it in a condition to produce, are ſo conſiderable, that the expence they demand are often above the ſtrength of the undertakers, and eaſily exhauſts the funds of private perſons. Beſides, if theſe works are not well underſtood; if thoſe who preſide over them, as well as the furnaces, are not extremely well verſed in the ſcience of mines, the charges in a little time amount to ſuch large ſums, that princes themſelves are often obliged to abandon the ſcheme. In fine, when perſons upon too ſlight notions have expected to find a mine where nature hath not formed one, it is plain that the expence turning to pure loſs, becomes entirely deſtructive; eſpecially as they often

often obſtinately perſiſt in ſearching for what they deſire, and will never find, through an infatuation, in which pride and ſhame have as great a ſhare as the deſire of getting ſomething for their indemnification.

My intention in ſo ſaying, is not to diſcredit mines; on the contrary I am perſuaded, as all thoſe who underſtand nature maintain, that the riches under ground infinitely ſurpaſs thoſe that are above it; but my deſign is, to prevent thoſe who form ſuch enterpriſes from vainly flattering themſelves with the hopes of ſucceſs, unleſs they are endued with uncommon knowledge, perſeverance proof againſt all accidents, and poſſeſſed of ſums ſufficient to defray the whole expence; expence which ſometimes greatly exceeds the firſt calculation, on account of events which it is impoſſible for human prudence exactly to foreſee. I repeat it again, a perſon who precipitately engages himſelf in the works of a mine, without having beforehand taken a vaſt number of precautions, will infallibly meet with ruin, in a work that would certainly enrich intelligent and frugal undertakers.

The firſt and moſt eſſential of all theſe precautions, is that of being poſitively certain of the mine's exiſtence. I am not ignorant, that miners found their conjectures touching this ſubject upon divers natural ſigns, among which there are ſome very good and material; but as they are not

not confined to certain rules, and one only is not ſufficient, becauſe it is rarely found in the ſame circumſtances that attended it in former times, or in other countries, I think the perſons moſt ſkilful in this part of natural knowledge ought to be conſulted: theſe intelligent men, while they obſerve the ſame ſigns, will not truſt entirely to their teſtimony; they will examine the hiſtory of the country, to know if mines were formerly wrought in ſuch a place; they will endeavour to diſcover ſome veſtiges of them, ſuch as cuts or trenches in mountains, the wreck and droſs of minerals and metals which have been worked, eſpecially near rivulets. Paſſages far advanced in the ſides of mountains, through which water uſually iſſues, and deep pits dug by the hands of man, are likewiſe ſure proofs of treaſure left us by the antients, there concealed. Here it will be proper to obſerve, that theſe paſſages and pits being uſually ruinous and half filled up, cannot be repaired but at a very conſiderable expence; and therefore it will be more prudent to abandon than to endeavour to uſe them, unleſs the uſe of them be abſolutely neceſſary; for from the ſimple appearance we cannot exactly diſtinguiſh, whether they were pits dug through meer curioſity, and to ſound the mountain, or really led to mines that were worth the trouble of working. But, in my opinion, the ſtrongeſt and moſt evident proof of mines that were heretofore open, is taken from heaps of ſcoria or droſs, found here and there upon the ſides of rivulets; and it has this advantage

tage above all others, that while it confirms the exiſtence, it likewiſe demonſtrates the quality of the mine; for there are no ſcoria ſo exhauſted, but that by ſkilful eſſays they will yield ſome ſample of the metal which they formerly contained; a meaner uſually leads to a better kind of metal; and it is eaſy to learn, from the minerals and ſcoria, what the metal is that may be expected from the mine.

When by theſe aſſurances we find the utmoſt probability of the exiſtence of a mine, the next care is to think of providing neceſſary materials for the buildings and furnaces; which materials are wood and ſtone: the firſt is the moſt difficult to procure, not only becauſe a great quantity, and that well choſen, is wanted; but likewiſe, becauſe it is only to be found in large foreſts belonging to ſome prince or powerful nobleman, whoſe officers always grudge to deliver ſo many thouſand trees to be buried under mountains, without any apparent utility, while they are wanted for an infinite number of uſes that ſeem more neceſſary. Beſides, the foreſts are often at ſuch a diſtance, as makes the carriage of the wood extremely expenſive. In opening a mine, therefore, the firſt object of œconomy ought to be the ſparing of wood as much as poſſible, ſubſtituting ſtone in ſeveral works. I know the miners will find fault with this expedient; but if they uſe it ſeaſonably, and make their works with care, they will be as ſecure in them as in the others,

others, which they will ſoon learn to diſpenſe with.

Stone-work may be employed in all the principal outlets of water, diſcharged through long ſubterranean conduits, which ought to be carefully vaulted: the ſame method will anſwer in the ſmaller outlets, which may be made a little broader than uſual, that is, upwards of four feet. Perhaps cuſtom and experience will ſhew, that it would be poſſible to make all the conduits of ſtone work, without running any riſque, provided the form of them be a little altered; and certainly it would be no difficult matter to prove it; but I ſhall not here enter into ſuch a large diſcuſſion.

It may be objected, that theſe ſtone works would not be durable on account of the ſoftneſs and frailty of the ſtone: I anſwer, that if the work is well built and plaiſtered when finiſhed, that inconvenience will be prevented, even though the lower part of the wall ſhould not be defended from the water. That the work may have all requiſite ſolidity, it is therefore eſſential to chooſe good ſtones, and make excellent mortar.

Stones are neither ſcarce nor dear, and people are very ſeldom under the neceſſity of bringing them from afar; and in this conſiſts the great ſaving. Limeſtone is often found in the mine itſelf; ſand and clay ought to be collected in

great heaps in the neighbourhood; and if there is earth of ſuch quality as to do the ſame ſervice, it ought not to be neglected. It is well known, that lime ſlacked with caution, ſo as that its fat ſmoke ſhall not evaporate, becomes of a tenacity proof againſt every thing, and makes excellent mortar. Wherefore, ſtone-work built and cemented of ſuch materials, will be capable of reſiſting the ſtrong and continual action of the water, and will not eaſily diſſolve.

We may likewiſe include in the number of materials, all ſorts of wood and iron inſtruments which the miners have occaſion for in their works: but this article is attended with no difficulty, unleſs the miners are ſent into a new world, or places abſolutely uninhabited. They themſelves can make a number of utenſils, and merchants furniſh them with the reſt: as for the materials of theſe inſtruments, they are common every where.

All theſe things being ſecured and provided, the next conſideration is that of building furnaces and fonts. Here likewiſe ſtone and wood are the firſt neceſſary materials. All ſuch ſtones muſt be rejected, as ſoon vitrify, and alſo thoſe, which being too ſoft to bear the fierce heat exhaled from the metals and minerals, are too eaſily conſumed. When ſtones are wanting, you muſt ſearch for proper earths to be ſubſtituted in their room: thoſe who work at glaſs manufactures, if there are any ſuch in the country, and even potters, can

can give good information on this ſubject; but great addreſs is often required to extract from them ſuch information, which, frequently, it is not their intereſt to communicate.

Wood is abſolutely indiſpenſible in the fonts or founderies: in vain people flatter themſelves that they may uſe pit-coal in lieu of it, unleſs the ſecret be found to diveſt it of its ſavage quality, or repeated experience aſſure us, that the quality of the mine will ſupport its effect. But in order to diminiſh the conſumption of wood, which is a very material conſideration, the fuſion may be facilitated by mixing different minerals with the ore, according to its quality. Every mine furniſhes ſeveral ſorts of theſe, and the profit ariſing from the ſale of ſuch as are not uſed in the work, is one of the firſt advantages it yields. The pyrites, for example, is very ſerviceable in fuſing the ore that contains ſilver or lead, and too much pains cannot be taken in procuring it gratis. The excellent treatiſe upon Pyrithology, publiſhed by Mr. Henckel, ſaves me the trouble of expatiating upon the utility of that mineral, for the perfect knowledge of which, recourſe may be had to his performance. Beſides, ſeveral metals fuſed together, are known to yield a produce much more rich than that which is obtained from the mixture of a few, or the fuſion of one only.

How important ſoever theſe materials may be for building the furnaces and the fonts, water is not leſs eſſential in the execution of mines; it ought to be conſidered even as the workman, and will ſpare abundance of labour which would be very troubleſome to the men, and very expenſive to the builders. By means of water, the wood is occaſionally tranſported, and the water, and even ore, conveyed out of the mine: it waſhes this laſt, ſeparating it from all impurities and foreign matter, and collects the moſt ſubtle particles of the metal, which eſcape the hand and eye of the workman. The ſervice which it does in the fonts is amazing; and I know nothing comparable to its force and equality in making the bellows work: this, therefore, ought to engage the chief attention of thoſe who propoſe to open a mine. In thoſe of ſilver or lead, there is almoſt always a ſufficiency; but there are mines of copper, and eſpecially of tin, ſituated in parched and barren ſpots, where there is no water. In this caſe, before the work is undertaken we ought to examine diligently from whence it can be drawn, and whether it is poſſible to give it the neceſſary fall; for when we have once begun to ſet up a mine with great expence, which we would not care to loſe, and afterwards be under the neceſſity of finding water, digging canals, making ſluices, and ſeveral other works of that kind, we ſhould be involved in an enormous expence, which in hilly countries riſes ten times higher

higher than if we were to work in the plain. It is therefore of the laſt conſequence, to obſerve carefully whether there will be a ſufficiency of water, and from whence it may be brought in caſe of neceſſity.

All theſe meaſures being taken, the next care is to find miners, the choice of whom is far from being a matter of indifference. As all mines do not reſemble one another, ſo neither are they worked in the ſame manner. The little eſſays made upon the ore, old ſcoria, or other marks, will indicate the ſpecies of the mineral, and its matrix, whether it is included in firm or in ſandy ſtones, or in thoſe that contain ſlate; whether it is found in continued or interrupted veins, or by heaps, with an infinite number of other circumſtances: then reaſon will prompt us to procure workmen who have laboured in places where the ſame, or nearly the ſame ſort of mineral was found; for not only thoſe who cut, waſh and ſeparate the mineral, will be more maſters of their buſineſs, but the officers will better underſtand the conduct of the veins, their manner of riſing, falling, dividing, rejoining, &c. and when the vein is all at once interrupted, know where to find it again without being perplexed: the ſmelters too will be more expert in managing an ore they are acquainted with; they will know what muſt be added for the fuſion, how to regulate the fire, order the furnace, burn and calcine the ſtuff, and ſeparate that which is of a foreign

or fierce quality: and theſe things cannot be expected from thoſe who have never been employed on the ſame matter.

It is not enough to have expert miners and ſmelters, it is likewiſe indiſpenſibly neceſſary to have people conſummately ſkilled in the art of mining; becauſe in the different operations to which it is ſubject, difficulties and perplexities will occur, which nothing but ſuperior knowledge can remove. I know places, in which certain operations are performed by an art which is confined to the head of a ſingle man: too much pains, therefore, cannot be taken in engaging one of thoſe excellent men, who are very rare in all times and in all countries. Care muſt be taken, not to encumber the work with too great a number of hands: the firſt reaſon that occurs, for preventing this error, is œconomy, which ought to hinder us from engaging in ſuperfluous expence; but this is not the ſole conſideration; it is well known, that too many workmen embarraſs and hurt one another, ſo as that the work is conſiderably retarded. Moreover, it will be neceſſary to give them reaſonable ſalaries, and conciliate their good-will by all ſorts of kindneſs and favour; for it is but juſtice to obſerve, that miners are hot-headed, and if on their return to their own homes they ſhould once decry the mine, it would be impoſſible to engage others; and in that caſe, there would be no great diſtance between the beginning and end of the ſcheme.

It is extremely neceſſary to have very conſiderable funds at the opening of a mine; for it is equally diſagreeable to be obliged for want of money to diſcontinue the works that are begun, or abandon them, after having ſuſtained almoſt the whole expence. With regard to this ſubject it has been aſked, whether ſuch an enterpriſe is more ſuitable to a prince than to his ſubjects? The difficulty of the queſtion conſiſts in this, that it is contrary to the intereſts of a prince that his ſubjects ſhould ruin themſelves, and contrary to the intereſts of the ſubjects, that a prince ſhould throw all his finances on one ſide, at the riſque of loſing them, while other parts of the public affairs are ſuffered to languiſh and be neglected. But this difficulty furniſhes a ſolution for itſelf; for it plainly appears, that the common good will be found in ſharing the profits and expence. The prince might eſtabliſh a general adminiſtration of the fonts, and build at his own expence the principal diſcharge of the water from the mine, which at the ſame time ſerves to give a ſtream or current to the water, and an healthy and free air to the miners. This laſt point alone ſecures to him the right of levying a ninth part upon the whole product of the mine; and his advancing money on this occaſion, is a great relief to private companies, who can with the greater eaſe finiſh the building and work the mine. So both ſides will be benefited if the mine produces ſomething, though it be not in a condition to yield large contributions; and if the enterpriſe has not the

ſucceſs that was expected, the loſs will be the more eaſily ſupported, and the ſtate in general be no great ſufferer.

But the benefit which the prince draws in ſpecie from a mine ſucceſsfully opened and wiſely managed, is one of the leaſt advantages he reaps from it. As a ſovereign is only powerful in proportion to the number of his ſubjects; rich only as they are wealthy; and as the ſource of their wealth is their being able to extract from their own ground all that is capable of producing; I believe no body will deny, that theſe three objects are moſt perfectly anſwered by the working of mines; for by limiting themſelves to the culture of the ſurface, without digging into the boſom of the earth, they voluntarily deprive themſelves of what is therein contained. If theſe contents are precious metals, thoſe that foreigners import appear to be of an higher value, and they exact a greater number of commodities in return; and if they are uſeful metals, the neceſſity of having them, and their ſcarcity, obliges people to buy them of their neighbours at an extravagant price; and the arts languiſh either for want of matter to work upon, or lack of inſtruments, the dearneſs of which is a continual check upon induſtry. Mines that are open and ſkilfully worked, obviate of themſelves theſe inconveniencies, which are very conſiderable in the eyes of every ſtateſman: and not to mention any mines but thoſe that are in leaſt eſteem, ſuch as copper, tin, lead and iron,

iron, how beneficial are they to every ſpot where they are diſcovered? One mine is ſufficient to change, in a few years, the ſmalleſt village into a town of four or five hundred families. All the artiſans who uſe the metal of that mine, haſten thither to ſettle, and viſibly multiply upon the ſpot: a number of others, who are neceſſary to them, follow the ſame route; merchants go thither; the conſumption becomes conſiderable; the country people in the neighbourhood are encouraged to cultivate their lands, and take care of their cattle: they are now more than ever in a condition to pay their taxes, ſo that the prince's revenues ſuffer neither delay nor diminution; they even increaſe by what is raiſed on the conſumption of proviſions, and by the quick circulation of coin occaſioned by work and trade, which makes it paſs in a little time through an infinite number of hands, each of which depoſites ſome part of it in the treaſury of the ſovereign. Theſe advantages, which are ſtriking on the ſpot, become alſo ſenſible at a diſtance, even through the whole extent of the country. As ſoon as metal is found in their own dominions, they are no longer tempted to bring it from abroad; the money ſtays in the kingdom, and the foreigner has no longer the commodities at a low price; the poor workman has leſs difficulty in furniſhing himſelf with utenſils, and finds it more eaſy to ſubſiſt; he who is in eaſy circumſtances gives a looſe to his genius, and in the new works of his imagination no longer fears the riſque of the moſt

moſt doubtful experiments, becauſe the loſs of the whole is incapable of incommoding him. It is perhaps to this laſt cauſe, as much as to the ſpirit of invention aſcribed to the Germans, that Europe owes ſo many new arts which have taken their riſe in Germany: for though we reckon ſeveral inventions formed upon metalline and mineral ſubſtances, ſuch as printing, engraving, gunpowder, cannon, &c. it would be eaſy to deſcribe them all in a few pages; but if one was to undertake to give a detail of all the unſucceſsful experiments which preceded theſe inventions, he would compoſe a terrible number of volumes. This prodigious multitude of experiments, therefore, proceeded from the abundance of matter; an abundance which no prince can favour too much, ſince, without repeating what we have ſaid above, of the augmentation of his revenues, it not only for the preſent increaſes his duties, by the export that is made to other countries, but in the ſequel, and when leaſt expected, gives birth to ſome art which forms a new trade in his dominions, employs his people to advantage, and extends the fame of their genius to the extremities of the earth, and the moſt remote poſterity.

Let no man therefore be diſcouraged by what I ſaid at firſt, upon the opening of mines: mankind cannot expect to acquire great wealth without undergoing great difficulties; and the more ſolid that wealth is, the greater riſks we muſt run in order to ſecure the poſſeſſion of it, and the

the more time, patience and reſolution is required to ſucceed. My intention was only to awaken the prudence of the undertakers, who frequently, by too much precipitation, expoſe themſelves to loſſes which they might have eaſily avoided, and to convince them, that a ſuperficial view is not ſufficient in enterpriſes of this nature, which certainly can never ſucceed, unleſs all the difficulties which occur in the execution have been obviated beforehand; nay, it is the prince's intereſt to watch and take care, that all the meaſures are well taken; becauſe, as the profits of thoſe who ſucceed encourages and excites others to ſearch for new mines; ſo people are eaſily diſguſted, when they have nothing before their eyes but uſeleſs works and ruined adventurers; a circumſtance that tends directly to deprive his dominions of their natural advantages, and to enrich his neighbours at the expence of his own ſubjects.

Of

Of the Improvement of AGRICULTURE.

A Connoiſſeur very much attached to agriculture, though not at all confined in his ideas to ſimple theory, after much reflection and many experiments, hath committed to paper thoſe of his ſentiments on the ſubject which he thought moſt likely to benefit the public, to which we now tranſmit them with the ſame view.

The author begins by complaining, that we have very few good experiments upon agriculture. It is ſurpriſing, that in ſuch an enlightened age, that boaſts of having reſcued natural knowledge from the errors of antiquity, men ſhould expreſs ſuch indifference for the moſt eſſential part of that ſcience; and among ſo many learned men, who have made themſelves illuſtrious by their diſcoveries, no perſon ſhould have thought of rendering himſelf uſeful to the labourer, out of gratitude for the fruits we reap from his toil. Far from having done him great ſervice, in teaching him that the moon has none of thoſe virtues which were formerly aſcribed to her, and that inſtead of acting upon terreſtrial bodies, ſhe only exerts her influence upon the ſea; even ſuppoſing theſe aſſurances to be exactly true, the little advantage gained by this knowledge cannot excite him to diſpel the thick clouds of ignorance by which he is

ſurrounded, or to ſhake off the yoke of prejudices to which he is ſubjected. True it is, the orchard, flower and kitchen gardens, are brought to great perfection by the knowledge of thoſe connoiſſeurs, who have made them their particular ſtudy; but though theſe three articles conſtitute a part of agriculture, it is but the leaſt part, while the moſt conſiderable, which is the cultivation of corn, is left to the moſt ignorant ſet of men, whoſe utmoſt capacity conſiſts in carefully doing that which was done by their forefathers time out of mind.

This profound neglect of huſbandry, which ſeems to have fallen into contempt, appeared to our connoiſſeur altogether unjuſtifiable, except in two caſes, namely, when it is impoſſible to remedy the barrenneſs of the ground, and when the multiplying virtue of the ſeed cannot be augmented. For this laſt purpoſe, certain methods have been found by knowing perſons; and as to the firſt, there is no room to doubt the poſſibility of it; for although the ground was curſed on account of man, this malediction did not extend to abſolute ſterility, but only to a conſiderable diminution of its natural fruitfulneſs, which the toil of the moſt ſkilful and perſevering man can never reſtore. Beſides, daily experience teaches us, that a field bears more or leſs according as it hath been well or ill cultivated; and ſince the country people, who are void of learning or much reflection, by ſimply following the common cuſtom

of

of their country find ſuch difference in the produce of their work, may not we flatter ourſelves that the advantage will in like manner be increaſed, if we bring theſe ordinary cuſtoms to perfection? If it be ſaid that there is no addition to be made to theſe cuſtoms, and that ſince lands began to be cultivated, that perfection would have been found, had there been any ſuch thing to expect; it is eaſy to anſwer, that we are not to expect it from country people, who have neither underſtanding nor means to improve their grounds; and that agriculture being a ſcience, is as difficult to learn as any other. We ought therefore to perſuade ourſelves, that let the preſent method of cultivating lands be never ſo good, it will always be poſſible to improve it.

Upon this foundation, our connoiſſeur examines what conditions are neceſſary, in the preparation of the ground and the ſowing, to give the peaſant a right to expect a plentiful harveſt: he finds theſe to be five, which muſt be obſerved together, without forgetting one ſingle article; for one being neglected, is ſufficient to deſtroy entirely the effect of the reſt. Theſe five conditions are; 1. That the land ſhall be well broke or ſoftened. 2. That it ſhall be perfectly cleared from weeds. 3. That it ſhall be pretty fat, and full of nouriſhing juice. 4. That the ſeed be ſown deep enough. 5. That the grains ſhall be ſcattered at a proper diſtance from each other.

The

The earth ought to be ſoftened; that is, in the courſe of repeated labouring, the clods ought to be carefully broken and bruiſed, and as much as poſſible reduced into duſt, that it may the more eaſily receive the influence of the heavens, and be penetrated with the ſap which they ſhed. The author would not have us be afraid of tilling deep, leſt we ſhould turn up the wild ſoil that is pretty commonly found under the firſt cruſt or ſurface of the earth; becauſe, he ſays, its ſavage nature may be tamed with dung.

The neceſſity of weeding the ground is plain; but the ordinary harrows are abſolutely inſufficient to clear the land as it ought to be: the author therefore invented one which is more effectual; but as he has not yet communicated the deſcription, the nature of it is not known. As to the manure which is put upon lands, it is ſeldom uſed to exceſs. But our author obſerves, that bad crops do not ſo much proceed from a want of nouriſhing juice in the earth, as from the difference of theſe juices, all of which are not proper for the ſame fruits. He quotes, for example, the oaks and willows, which grow in ſandy grounds; for which reaſon the earth muſt be prepared in different manners, according to the different ſeeds that are to be ſown.

The ſeed ſhall be deep ſown. It is the intereſt of the huſbandman to obſerve this rule, that the birds

birds may not perceive and pick it up. It takes root more quietly, without being diſturbed by the winds, and more eaſily draws its needful nouriſhment from the earth. In fine, the ſeed ſhould be ſcattered with order, that the grains may not be ſo near as to injure one another; for it often happens, that when they are ſown too thick, either the ſtrongeſt grain attracts to itſelf all the ſubſtance of the earth, and ſtifles the reſt, or all together remain weak, and produce little advantage.

This eſſay having tranſpired, came to the knowledge of another connoiſſeur, a lover of agriculture too, who not being entirely ſatisfied with the performance, made ſome remarks which were communicated to us, and of which we ſhall give an abridgment.

He firſt of all very judiciouſly obſerves, that agriculture being a ſcience, the aim of which is and ought to be utility, it is not adviſable to change any thing in the received cuſtoms and practice of it, without having made ſeveral experiments, and being aſſured that they will greatly ſucceed; becauſe, otherwiſe, a man will expoſe himſelf to great loſs, and ſubject to the ſame misfortune all thoſe who ſhall follow his method and example.

He is not at all pleaſed with that rule, of tilling generally to a great depth, though he owns it

it is attended with no inconvenience in ſtrong ground, which ought to be well turned up; but the whole labour would be loſt in ſlight grounds, eſpecially in throwing up the wild ground upon the ſurface. In vain it is pretended, that the ſterility of ſuch ſoil would be ſurmounted with dung; this would not happen till after ſeveral years, during which, not only the ordinary profit, but even the cuſtoms of ſuch lands would be loſt. Beſides, to produce a good quantity of dung, it would be requiſite to have a great deal of cattle, forage and ſtraw, and if there is a want of forage and ſtraw, the cattle cannot poſſibly ſubſiſt; nor will any perſon be ſo fooliſh as to neglect his good lands, in order to beſtow all his dung upon thoſe that are bad: ſo that the fields in queſtion, bearing nothing the firſt or ſecond year, it will be impoſſible to meliorate them for the following years, without ſacrificing all one's revenue for an experiment of little or no advantage. We ought therefore to content ourſelves with following the common method, ſlightly labouring the ſlight grounds, without taking pains to reduce them too much to powder; for ſome there are like aſhes, and far from cruſhing and ſcattering ſuch mold, it is on the contrary proper to hold the clods together, and give them ſome conſiſtence, that they may retain the rain, and that the root of the corn being covered, may run no riſque of being withered by the wind, or ſcorched by the ſun.

It is a miſtake to believe that nouriſhing juices are never wanting in the earth, and a meer illuſion to mention by way of proof the oaks and willows that grow among ſand: in ſuch ſoil the oaks riſe ſo ſmall, and the willows ſo dry and ſtiff, as to ſhew plainly a want of nouriſhing juice. In effect, all ſorts of juice conſiſt in a kind of water; ſand will retain no water, conſequently cannot furniſh vegetables with proper nouriſhment. True it is, continues our critic, the ſeed ſhould be well buried, and the grains equally ſown; too much pains cannot be taken in theſe operations. When the author of the eſſay ſhall make known his inventions of an harrow and ſeed-bag, we ſhall be able to judge of them; and the public will be very much obliged to him for effectual means to clear the ground of noxious weeds, cover the ſeed and ſow equally, with new machines, the commodious uſe of which may ſave time.

As to the augmentation of the ſeed, although he will not pretend to doubt what ſo many learned men have ſhewn and demonſtrated by experiments, he cannot perſuade himſelf that the method will greatly ſucceed; or that the caſe will be the ſame in a field of ſeveral acres, as in a box or bed of a garden. He maintains, on the contrary, that the ears of wheat will not ſhoot up to ſuch enormous length, nor bear ſuch a quantity as is ſuppoſed; or even, if that were the caſe,

caſe, the wind and rain would but too eaſily lay ſuch long ſtalks, whoſe heads would be heavy enough to ruin all hope of harveſt; that the ſame thing would happen to the ſtalks of corn, which puſhing up ſucceſſively, would not equally ripen; whence there would not be ſuch an abundant crop of good grain, as the farmer had flattered himſelf to obtain: with regard to the ſeed's being medicated before it is ſown, ſo as to become larger than ordinary ſeed, it is of ſmall importance to the reaper, whether the wheat produces one or ſeveral ſtalks; for that ſeed producing no more in the ſame ſpace, than what would have been produced by common ſeed, becauſe this laſt would have been thicker ſown, it follows that the only advantage would be a ſaving of ſeed; and even that would be no advantage, unleſs the preparation were eaſy and cheap; eſpecially as in the intervals which muſt be neceſſarily left between the prepared grains, numbers of weeds would riſe, confine and choak up the young corn, hindering it from growing and bearing the expected fruit: hence, we ought to conclude, that theſe multiplications, ſo curious and ſplendid in ſpeculation, are of no uſe in practice; and muſt be of great detriment to huſbandry, in the loſs of time, expence, and ſometimes a great part of the crop.

Theſe are the remarks of the ſecond connoiſſeur, on the eſſay of the firſt. We will not wholly adopt either the eſſay or the anſwer; but

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rejecting what ſeems too ſlightly advanced, and retaining what is founded upon reaſon, we ſhall obſerve, in the firſt place, that the author's complaints of the few experiments which have been made upon huſbandry, are very juſt; but it is not at all ſurprizing, that he ſhould have reaſon to make theſe complaints. The learned, whom he attacks on this head, retire into towns, where only they can cultivate the ſciences with ſucceſs. Now, by living in towns, they loſe ſight of almoſt all the objects of country œconomy: thoſe which remain under their eyes, are only the kitchen-garden, fruit trees and flowers; and ſince the author allows that great progreſs hath been made in theſe three parts of agriculture, he cannot reaſonably expect more from the learned. It is the buſineſs of thoſe who lead a country life, to make reflections and experiments upon huſbandry. We addreſs ourſelves to the nobility, who having for ſome time fulfilled their duty to the ſtate, are retired to their own lands, to paſs their lives in that eaſe and tranquility which are ſurely equivalent to the ſplendour of the dignities to which ſo many others aſpire: We ſpeak alſo to thoſe citizens in eaſy circumſtances, who being diſquieted with a noiſy town life, amidſt which they ſtudied in their youth, have wiſely confined themſelves to the cultivation of the lands of their anceſtors; and who having retained a tincture of the ſciences which they learned, are more proper than others, to obſerve the effects of nature, to penetrate into her views, to contrive

trive means for aſſiſting her, and to make uſeful experiments. Theſe are the two ſorts of people, together with the intelligent clergymen ſettled in livings up and down the provinces, whom we exhort to communicate to us their reflections, diſcoveries, and the happy ſucceſs of their endeavours.

In the ſecond place, we will obſerve, with the critick and all huſbandmen, that lands muſt be differently cultivated, according to their different natures. In effect, there is a certain degree of conſiſtence which they ought to have, in order to fructify the ſeed, and preſerve the roots of it. Fat land of itſelf coheres in clods too eaſily, and we run no riſque in opening, bruiſing and reducing them to powder; but the ſame pains muſt not be taken in very poor ground, which being too much divided, will never rejoin, not even round the roots of the corn. As for the depth of the furrow, we will be very far from agreeing with the author, in penetrating ſo as to throw up the wild earth, in hope of its producing a good crop, when ſoftened and fertilized by a great quantity of manure. His opinion is by no means ſupportable, when he affirms that the earth never wants nutritive juices; nor is that of the critick on this ſubject, very exact. The earth is not enabled to bear fruits, meerly by the influence of the heavens; nor are they produced ſolely by the ſap and nutritive juices of the ground: but owing to a concurrence of

 both.

both. The rain, dew and ſnow, convey to the earth a ſalt and nitre, which fortifies and puts in action that which is formed in its ſuperior cruſt, by thoſe vapours of different qualities, which the central fire throws up continually towards the ſurface; and theſe operations are aſſiſted by the winds which moiſten, dry, open and ſhut the ſame ſurface. But as the influence of the air does not always correſpond with the good diſpoſitions of the ſoil; ſo the earth is not every where proper for profiting by the favourable influence of the weather: and if it be true that there is no earth which deſerves the name, without ſome degree of fecundity; it is likewiſe certain, that there is ſome ſo poor in point of fertility, that the richeſt harveſt it can bear, will never indemnify the farmer for the charge of cultivation. In this laſt caſe, a wiſe œconomiſt, perceiving that he can neither expect a crop or paſture from ſuch ungrateful ground, will take pains in ſowing or planting it with wood, which requires neither humidity nor a great depth of ſoil; for example, with cheſnut-trees, which will always grow large enough in ſix or ſeven years, to furniſh excellent hoops for caſks, even if they ſhould never ſucceed ſo well as to bear fruit, or become fit for carpenters work.

In the third place, the neceſſity of rooting up noxious weeds, is inconteſtable; and the field cannot be too much cleared of them. But it is not enough to root them with great exactneſs; the roots muſt be turned upwards, leſt they ſhould take

take hold again, and it is truly problematic, whether it would not be more advantageous to carry them off than to let them rot on the field: for, though in rotting, they perform the office of dung, we ought to conſider whether their ſeeds when they are ripe, do not vegetate in the earth, which is always favourable to them, and puſh out new ſtalks, to the great detriment of what is afterwards ſown in that ſpot.

In the fourth place, the maxim of ſowing very deep, though never ſo good, ought to be reſtricted within due bounds: for, it is allowed that the corn ſhould be buried, in order to throw out ſtrong roots, to imbibe the greater quantity of nouriſhing juices by theſe roots, which are moreover preſerved more freſh; we have reaſon to fear, that if it is planted too deep, the ſtalk will not be able to pierce and cover the ground with its leaves, and by their means extract from the air ſuch aliments, as enable it to grow and bear fruit. Fifthly and laſtly, it is eaſy to perceive, that with regard to the preparation of ſeeds, in order to encreaſe their multiplying virtue, the critick believes what the author advances only out of deference to the learned men, who have given receipts for that preparation. In order to judge right on this article, it is neceſſary to examine it with attention, and to diſtinguiſh the poſſibility of the thing in itſelf, from the uſe which may be made of it. The poſſibility does not ſeem doubtful, becauſe it contradicts none of the principles of natural philo-

ſophy. If the different beings which the earth produces and maintains, if the vegetables now inqueſtion, have a certain degree of fecundity, beyond which they remain without virtue, the knowledge of that degree is a ſecret which the Creator has reſerved to himſelf; and as men are blameworthy when they neglect to excite this fecundity, we ſurely cannot but commend them, when they try to diſcover by experiments, how far that virtue will extend. Yet, in order to manage this work to purpoſe, it is not enough to know perfectly how to prepare the ground, and chooſe the faireſt and beſt ſeeds; we muſt likewiſe be acquainted with the moſt hidden principles of bodies, and with the ways by which nature conducts them to perfection; people addicted to agriculture have not been able to uſe more than the ordinary precautions; while the learned of themſelves, by the light of chemiſtry, have diſcovered much more excellent methods than thoſe that are uſually practiſed. Theſe gentlemen conſidered that every ſeed contained an imperceptible ſhoot, compoſed of three principles inſeparably united, namely fire, water and fixed matter, known under the names of ſulphur, mercury and ſalt; that this ſhoot, in order to unfold and extend itſelf, and produce the plant, attracts all that is of its own nature, from the air as well as earth. They likewiſe obſerved that theſe ſhoots, though of the ſame ſpecies and genus, are of unequal vigour, and that even the moſt equal of them, prove different in the production, by the nature of

of the ſalt, the qualities of the air, and the ſkilful or unſkilful cultivation of the ground. From theſe obſervations they concluded that art beginning where nature ends, it might be poſſible to ſtrengthen the ſhoot, to fortify it againſt internal accidents, and encreaſe the attractive force of its ſuperior and inferior virtues. Knowing, beſides, that fire enters air, air is contained in water and water in earth; that earth and fire communicate by means of air and water; and laſtly, that all is originally water, becauſe this primordial fluid is at once water, earth, air and fire; they imagined that if a water were compoſed that ſhould contain ſome of the eminent qualities peculiar to the vegetable reign, and ſeeds be ſteeped in that liquid, it would, in penetrating theſe ſeeds, infallibly communicate to them the virtues with which it is impregnated; ſo that the ſhoot thus reinforced would act more powerfully, the plant produced be more fair and vigorous, and more eaſily draw from the weather and the ſoil what ſhould be neceſſary for its growth and preſervation; as a ſtrong and healthy man draws more nouriſhment from his food than can be extracted by a perſon who is ſickly and weak.

This theory being unanimouſly ſuppoſed conformable to nature, which they took for their directreſs, they eagerly went to work to put it in practice. Of the three principles which we mentioned, namely ſalt, ſulphur and mercury, ſalt is the

the moſt ſenſible and the moſt eaſily ſeized; but as theſe principles are abſolutely indiviſible, under the ſole appearance of ſalt, we likewiſe poſſeſs the other two, though in ſmaller quantity. This is the fundamental reaſon of thoſe curious vegetations, deſcribed by father Kirker and ſome other learned men. The eſſential ſalt of a plant, ſhut up in a vial exactly ſealed, being preſented to the heat of aſhes or a wax candle, puts itſelf in motion; the plant is ſeen to form, thruſt forth its ſtalk, its foliage and its flowers; a phænomenon which we ſhould in vain expect, if the ſalt was not ſeconded by the ſulphur and mercury. For the ſame reaſon, a dead animal is buried at the root of a ſick tree; its ſalts being diſſolved by the humidity of the earth, the three principles enter abundantly into the roots of the tree, and reſtore its former health and vigour.

The learned, hitherto agreeing, are divided in their choice of thoſe ſalts, without, however, contradicting themſelves, and according to their ſeveral lights, have contrived different compoſitions, which being ſenſible might be uſefully diſſolved in water, and form what they call a menſtruum, in which the ſeeds ſhould be ſteeped until they ſwell, when they have imbibed as much as they could contain, they were either ſown or planted; the ſhoot in the very inſtant of its unfolding, finding itſelf fortified by the union of thoſe ſalts, throws downwards deep roots, thruſts

thruſts upwards a vigorous ſtalk, and yields extraordinary fruit in point of number, taſte and beauty. The preparations for the ſeeds are not ſcarce in books: we reckon no fewer than twelve in the dictionary of Chomel; one we have publiſhed in our firſt journal, for the truth of which we are not afraid of repeating our aſſurances. If we find it is reliſhed and uſed by the public, we may poſſibly communicate another of ſuperior virtue, but which will require more time, care and expence.

The critick's reaſoning is mere ſophiſtry, when ſpeaking of the prepared ſeeds, he ſays that the neceſſity of ſowing them thin, will leave room for weeds, the quantity of which will confine and choak up the corn; that as this corn cannot fill up the ground better than the moſt plentiful harveſt, it would be ridiculous to expect a greater quantity of grain; and laſtly, that the ſtalks being too weak to ſuſtain thoſe wonderful ears that are expected, the firſt wind, the leaſt ſhower, would infallibly lay them ſo as that they would never get up their heads again. Does he ſuppoſe then that nature will forget to form ſtalks proportionable to the ears they muſt carry? how thick ſoever the ears may be in the beſt ſeaſons, may not they ſtill be thicker? is not the crop increaſed by the length of the ears, and the largeneſs of the grain? in fine, will not the roots of thoſe medicated ſeeds, which are deep, extenſive and vigorous, deprive

the weeds of that nouriſhment which would otherwiſe make them grow? None of theſe accidents, therefore, are to be feared: nor is there more ſtrength of argument in his ſaying that the ſtalks of corn, puſhing out and ripening gradually, the more ſtalks that one grain puſhes out, there will be the leſs ripe corn. He is bewildered by this notion of ſucceſſion. One would imagine he had meaſured the interval of time between the birth of two ſtalks, and that it is always the ſame, either in a weak or vigorous grain. But we have, both from art and nature, known examples of a ſenſible difference in theſe intervals. The grains of gun-powder kindle ſucceſſively, yet, nothing is more quick and violent than their effect. An oak is one hundred years, in arriving at perfection; while the parts of a muſhroom are ſucceſſively arranged in one night. Of two trees of the ſame ſpecies, but unequal ſtrength, and planted in different ſoils, that which is the ſtronger, the beſt expoſed and planted in the beſt ſoil, will grow much quicker than the other; yet both grow ſucceſſively. Succeſſion therefore, decides nothing; the interval required may be reduced to an imperceptible moment, without deſcribing the ſucceſſive order, and one hundred ſtalks may puſh out ſucceſſively, in as little or leſs time than ten. As to the maturity of the grain, the critick cannot deny it equal in proportion to that of ordinary harveſts; and if the corn that contains a greater abundance of the principles, comes ſooner to per-

perfection, as it will be difficult to doubt, our crop will certainly ripen more quickly and equally than the richeſt of thoſe which ſurpaſs the huſbandman's expectation.

The poſſibility of augmenting the multiplying virtue of the ſeeds being thus eſtabliſhed, nothing now remains but to examine into the utility of this expedient. This term of utility is very variouſly extenſive. A method is not only uſeful, when in diminiſhing the expence, it augments or even preſerves the benefit, or at the ſame charge is attended with that effect; but likewiſe, when in augmenting the expence it alſo augments the produce in a juſt proportion, or even above or below that proportion. If it is uſual, for example, to gain thirty in expending ten, it would be advantageous to ſpend fifteen in order to gain five and forty, fifty, or even no more than forty; becauſe in this laſt caſe, which is the leaſt favourable, one gains the double of the extraordinary expence. There is ſtill more difference in this utility: as mankind are divided into three conditions, namely, wealth, poverty, and middling circumſtances, a method may be uſeful to all three in general; perhaps only to two, or even to one: for theſe reaſons, ſeveral degrees of utility have been always diſtinguiſhed, and that title cannot be juſtly refuſed to the preparation of the ſeeds, provided it falls within any of the caſes we have deſcribed. If the preparation of ſeeds is in uſe among rich people, we dare not conteſt

conteſt its utility; nevertheleſs, that utility would be infinitely greater if it particularly affected the poor, becauſe their number is much more conſiderable; beſides, it would be eaſy to prove, that it is of much more conſequence to a ſtate to have few poor, than to have a great many rich: it is therefore quite ſuperfluous to examine, whether this preſcription for multiplying the corn in an extraordinary manner can be eaſily executed in one or two hundred acres; there is ſufficient reaſon for adopting it, if it can be practiſed ſucceſsfully in one, two, or three acres, becauſe a greater number of people will be found in this low condition than in the former: therefore the ordinary objection, of the difficulty of executing at large what has been tried in little, falls of itſelf on this occaſion, without preſerving even an appearance of reality.

But it will entirely vaniſh when it is obſerved, that there are very few things, if any, which can be carried from one extreme to another, without paſſing through ſome medium. In the preſent caſe we ought to remark, that he who poſſeſſes only two or three acres of ground, has not a compleat labouring equipage, and therefore to beſtow the neceſſary pains upon his fields, he is obliged to aſſociate with another as poor as himſelf; this we ſee every day in the country, where the cattle of one plough frequently belong to two maſters, who labour in perſon. If theſe two men ſhould make uſe of prepared ſeed, the alteration it would effect

effect in their ordinary labour would be altogether inconſiderable, and almoſt inſenſible; but this would not be the caſe with a man who has one or two hundred acres to ſow; for as he is obliged to employ a number of people, he could not, in giving directions, infuſe into his workmen the habit of this new work to which they are ſubjected; hence they would be eaſily put in diſorder; the maſter himſelf would be perplexed; for at one time he would be encumbered with too many people, and at another, he would not have enough. In effect, when the ſeed has received a good and ſtrong preparation, the land does not require ſo much labouring and manure, and the grains of the ſeed muſt be planted at a great diſtance, ſometimes of a foot, from one another; ſo that in labouring, he will have more ſervants and cattle than are neceſſary, and in ſeed time he will be in want of men. Theſe inconveniencies, inevitable to thoſe who would ſuddenly execute at large what is propoſed to be done at firſt in little, are capable of diſordering a man's affairs to a very great degree; and it is the firſt view of the conſequences of ſuch innovation in huſbandry, that frightens thoſe to whom it is propoſed, and hinders them from crediting the promiſed advantages of the ſcheme. But a wiſe œconomiſt, who would introduce the cuſtom of prepared ſeeds, will content himſelf with proceeding by little and little. After having ſown one acre in this manner, he will next year take the ſame method with three or four, and while the crop

crop is growing, reflect upon the moſt natural and certain means for having a neceſſary number of hands at ſeed time, and for performing that operation in the beſt order. He will begin to reform his train of huſbandry, or to employ it in another manner; for the occaſions of man are as inexhauſtible as his induſtry. Theſe meaſures, when taken, will render him more bold, inducing him to uſe the new culture upon a greater number of acres; and ſo from year to year he will at length come to cultivate his whole land in that manner, ſo as to make it turn to account. The ſucceſs of his undertaking will excite the emulation of his neighbours, and they will regulate their meaſures by the prudence of his conduct. Thus, without trouble or confuſion, the uſe of prepared ſeeds will take place, and agriculture flouriſh in the provinces, not in doing violence to, but in imitating nature, which attains its aim with vigour, becauſe it diſpoſes all things gently and without force.

The advantage of prepared ſeeds in enabling the ground to bear every year, without any neceſſity for its lying fallow, becauſe, inſtead of exhauſting, they meliorate and fatten it, hath given riſe to a difficulty as ſpecious as that which we have already combated: Fallow grounds, it is ſaid, are not altogether unfruitful; they furniſh paſturage for the cattle, eſpecially at thoſe times when they cannot be put into the meadows, and in thoſe places where there are no meadows, or

or any other part for their nouriſhment. If there are no fallow grounds, we loſe the advantage of our cattle, which, without contradiction, conſtitute the greateſt wealth of the country; for that they ſhould be ſtall-fed, is not a propoſal to be made: we muſt therefore abandon them, and from that moment there will be no more manure for the lands and gardens; meat will become extremely dear; milk, butter, wool, will riſe to an exceſſive price, and the abundance of corn will impoveriſh thoſe whom it ought to enrich. To take this objection in its full extent, without, however, entering into a detail which would carry us too far, we will anſwer, that the means offered for augmenting the richneſs of harveſts, and enabling lands to bear a crop every year, do not compel any perſon to put them in practice; that in thoſe places where there is no other paſturage than fallow ground, part may be left in that condition for the nouriſhment of the cattle, though ſuch places are ſo rare that they make but a very ſmall exception; that where the paſturage is not ſufficient, it may be eaſily ſupplied by the abundance of ſtraw and grain; that this very abundance of ſtraw and grain, in places where paſturage is common, will engage the farmer to raiſe a greater number of cattle; that dung, becoming leſs neceſſary for the land, will ſerve for the meadows, where it is often wanted, and ſo make the hay more plentiful and cheap. In fine, that by a continual alternation of crop and conſumption, living will become as eaſy as it is at preſent hard,

with thoſe who endure the greateſt ſeverities of it.

No ſolid objection, therefore, can be made to the preparation of ſeed; it is poſſible in itſelf; the uſe of it is general, and the effects of it very advantageous. If we have expatiated a little too much upon this article, we hope to be excuſed, when we obſerve, that in ſpeaking to the public, we ſpeak to three ſorts of people; to thoſe who penetrate into the principles and conſequences of things, to thoſe who do not diſcern, and to thoſe who deny them.

Of

Of the different kinds of MANURE for making LAND fruitful: Reflections on that part of AGRICULTURE.

THE reflections which we have to give on this important ſubject, oblige us to review and obſerve the properties of different kinds of dung and manure, which are not perceived by every body.

Dung of ſea-fowls. The dung of thoſe birds which retire into the iſles near the Continent, is the beſt of all fowl dung.

Duck and gooſe dung. This is deemed too hot and burning. The farmer is chagrined to ſee his land covered with the dung of wild geeſe; but if he would take care to throw ſtraw over it, or gathering it in a heap, as well as that of tame ducks and geeſe, mix it with the dung of large cattle, he would bring it to a temperate heat, and draw from it ſuch advantage as would indemnify him for the pains he ſhould have taken. The virtue of this method is known by experience: a farmer having abandoned a piece of ground to his geeſe for the ſpace of twelve years, at the expiration of that term turned them out to let the graſs grow, and it roſe ſo thick and ſtrong, that the ſcythe would ſcarce paſs through it.

Hen dung. This is ſcattered like a ſort of ſpice, in ſmall quantities, upon land intended to be ſown; and on account of its heat, it is never uſed except when rain is foreſeen. It is practiſed with great advantage for millet, and is an excellent manure for meadows.

Pidgeon dung is much the ſame with that of poultry, the only difference being its ſuperior heat.

Human ordure. The heat of this is beyond expreſſion, it being replete with an impure and burning ſulphur, that deſtroys every thing, unleſs employed with great caution; this caution conſiſts in mixing it with ſtraw, or leaves, if they can be got conveniently from the wood, and in leaving it expoſed for a year, or ſeveral months at leaſt, to the open air and rain. It muſt be turned up from time to time that it may rot, its bad qualities be deſtroyed, and its heat moderated. If theſe meaſures are taken, it will be found as uſeful as it is commonly thought dangerous, eſpecially if uſed in vineyards.

Aſs dung is the moſt eſteemed of any, and may be employed on the ground in any ſhape, without having lain long rotting in the yard: the reaſon aſſigned for this excellence is, that the animal being phlegmatic and ſtrong, eats ſlowly, and by grinding well his aliments, digeſts better than

than other creatures; whence it follows, that his excrements being more diſſolved, neither abound with heat nor humidity, and are nearer to putrefaction.

Sheep dung. This is of no duration, even when taken from the cotes, and ſtill leſs durable when the ſheep are folded. In this laſt caſe, in order to prevent a too ſudden evaporation of the dung, the ground included in the fold ought to be covered with chopt ſtraw or foliage, before the ſheep enter: but ſeveral farmers are diſguſted at this manner of dunging their lands, becauſe of the difficulty of dunging them equally; a taſk that requires a very careful and faithful ſhepherd, and becauſe, in order to profit by this kind of dung it muſt be immediately buried either with the ſpade or the plough. The wheat and barley that grow upon lands manured with ſheep dung are not proper for making beer, which contracts a bad taſte from it, and eaſily evaporates.

The dung of horned cattle is the moſt refreſhing of all; and this well-known quality points out what ground it beſt agrees with. It is a wiſe precaution to make a ſink in the ſtalls, paved and lined with ſtone, in which all the juice of the dung may be preſerved, by which means it is better kept from becoming acrimonious; and this juice is very uſeful in watering gardens, trees and meadows.

Pork dung is not commonly eſteemed, yet when mixed with that of large cattle, it manures the ground as well as any other; it is in particular deemed ſpecific in preſerving the hop from the bad effects of the mildew.

Horſe dung being naturally dry and warm, is little eſteemed by ſeveral farmers, but the moſt underſtanding are far from deſpiſing it: with this alone are made hot-beds; it is quite neceſſary for aſparagus, and when rotted, is excellent for all the plants of the kitchen-garden: indeed it is not eaſily rotted, but may be aſſiſted with rain water or ſoap ſuds, which fill it with ſalt and oil: it may likewiſe be mixed with cow-dung, which will temper its heat and dryneſs, and then it will be as good as any other kind of manure.

FATTENERS.

MOSS. This hath roots, and extends itſelf like weeds. It is neceſſary to root it up in order to favour the growth of wood; when brought into a heap, it is left to dry, and afterwards carried to the ground, where it ſerves the purpoſes of good dung, which are alſo anſwered by that which grows in parched or marſhy meadows, from whence it may be taken when the after-graſs is cut.

Flowers,

Flowers, fruit, leaves of wild trees, are uſually employed to fatten the earth, when the acrid ſalts, with which they abound, are tamed and ſoftened by putrefaction.

Sawings of wood are not commonly uſed, except where planks are ſawed, and are ſo long in putrifying, that they are ſcarce thoroughly rotted in two years. Gardeners find their advantage in uſing the earth that is formed of them, but it is eſteemed apt to produce bad weeds.

Knotweed, withered or burnt. This fatal herb, becauſe it extends itſelf prodigiouſly, and conſumes the whole fat of the land, is carefully rooted up by every good farmer: though it is not always ſafe to burn it upon the ſpot where it has been gathered; for if ever ſo little remains, it takes root again and creeps anew. The beſt method is to carry it off, and let it rot in the juice of the dung which we have mentioned above, eſpecially in that of ſheep dung, on account of the ſharp ſalt in their urine, by which it will be entirely corroded. When it is rotten, it becomes a moſt advantageous manure.

Marl, by the confeſſion of all authors of farming, is the moſt excellent dung: it is a kind of lime-ſtone, ſuppoſed to be the beginning of chalk; for it is imagined that chalk, before it acquired its conſiſtence and hardneſs, was of marl, and

that if it could be diſſolved and pulveriſed, it would be as uſeful as marl itſelf. This ſtone, which nearly reſembles clay, is either white, black, grey or yellow; ſometimes found under the firſt cruſt of the earth, and ſometimes taken from the depth of four or five fathom, for which purpoſe pits are dug in the places where it is expected to be found, though as yet there are no certain ſigns by which it can be diſcovered. Some authors obſerve, that it is always formed in marſhes that are dried and covered with earth, and that it is known by the bull-ruſhes that ſhoot up, and the ſhells that are found in the mole-hills of that ſort of ſoil. The moſt ordinary and beſt method for being aſſured whether or not there is marl in any particular ſpot, is to ſound it with a long hollow wimble in which there is a rod, with a croſs handle at one end. When the wimble hath penetrated far enough into the earth, this rod is drawn out, and brings along with it marl from the bottom. Marl is not always ſolid, but ſometimes liquid and muddy, though the beds of it are always very thick. The marl being taken out of the earth, is laid in ſmall heaps upon the land, and afterwards ſpread like ordinary dung. It is ſo replete with virtue, as to fatten the earth for twelve, fifteen, twenty, nay ſometimes thirty years, during which it will require no other manure. But being very hot, and that in different degrees, the quality of it muſt be examined, and proportioned to the nature of the land on which it is to be ſpread. It is dangerous to lay it on too thick,

thick, for in that caſe it will burn; but whatever precautions are taken, a good crop is not to be expected from it the firſt year; yet the farmer is amply recompenſed for this tranſient barrenneſs, by the abundance that follows. It will be convenient to marl the land in the autumn or ſpring, that being diſſolved by the rains which are uſual in theſe ſeaſons, it may enter the earth ſo as to fertilize it, let it be never ſo barren.

Green turf rotted or burnt. Wherever the farmer is not afraid to ſtrip the earth, as in old ditches, marſhes, &c. he carries away as much turf as he can take, lays it up in an heap, leaves it to rot for the ſpace of a year, and then ſpreads it upon the ground which he wants to fatten; it may alſo be uſed ſooner, if lime be mixed between the layers of it, for this will help to conſume it more quickly, and by impregnating the turf with its own virtue, of which we ſhall ſpeak in the ſequel, render it more fit to fertilize the ground. As to burnt turf, we ſhall relate in what manner an expert and induſtrious farmer conducted himſelf in the operation: he ordered a barren meadow, and at another time a piece of ground, to be ſlightly laboured in the ſpring, and ſo leaving them that whole year and the following, till the beginning of Auguſt, that they might have time to rot and dry, he gave directions for paring off the turf in pieces two feet ſquare; of theſe he built ovens reſembling thoſe that are uſed by bakers, with a ſide-opening below, to the

wind-

windward; through this opening a very dry faggot being thruſt into the oven was ſet on fire, and when well kindled, the oven entirely ſhut up with turf, and the fire preſerved within. The people employed to watch over theſe ovens, took care to lay new turf in every place where the fire penetrated and became viſible. This operation laſted ſeveral days and nights, until at length the ovens were reduced to heaps of aſhes, which were ſtrewed pretty thick in a field that was on the eve of being ſown. It produced the faireſt and the beſt of crops, and the ground, though before but indifferent, was conſiderably meliorated by this expedient. As for the places from whence the turf had been taken, which remained bare, they were covered with the remains of the turf which had not been burnt, together with earth ſcraped from the ſpots where the ovens had been; then being ploughed and ſown with oats in the ſpring, they were in condition to produce graſs as formerly. Thoſe who can find turf without being obliged to ſkin their meadows, will ſtill ſurpaſs this farmer in point of advantage.

Peaſe, vetches, lupins and beans. Nothing is more uſeful in fattening the ground, than to ſow theſe ſorts of grain, and before they come to maturity, cut them down, till and overturn them in the earth, without minding the ſmall profit that might be expected from the crop, in caſe they are left to ripen; for as theſe kinds of pulſe very much exhauſt the earth, it is eaſy to comprehend,

prehend, that the nouriſhing juices are more abundant and perfect in the fruit than in the ſtalks and leaves; and that if the fruit is carried away, we cannot by overturning the reſt reſtore to the earth all that ſhe has given. We ought not, therefore, to diminiſh in any ſhape the produce of the ground, nor even ſtay until the fruits are ripe, in order to bury them; becauſe then the ſtalks have loſt a certain vigour and volatile ſpirit, which on account of their activity ought to be preſerved and ſhut up in the earth, where being retained, they are rendered more fit to fructify the ſeed which ſhall be afterwards ſown: beſides, we ought to conſider, that what is ſuppoſed to be loſt, in omitting to gather the fruits, will be retrieved by the ſaving of dung, which will not be wanted for the land, as well as of carriage and workmen to ſpread it. Nevertheleſs, for a ſupply of grain we may reſerve a piece of ground to be dunged as uſual, on which pulſe may be left to ripen for a crop. This kind of fattening is moſt proper for high grounds, to which it would be troubleſome and expenſive to carry dung.

Pond mud. Under this name we underſtand not only the mud of ponds, but likewiſe the ſlime that rivers depoſite when they retire, after having overflowed their banks, and that which gathers on the declivity or at the foot of high places, in pits that are either natural, or prepared by the induſtrious farmer. This ſoil is excellent, becauſe it is new. It muſt not, however, be employed imme-

immediately, eſpecially the mud of ponds, becauſe being extremely moiſt it would chill the earth, and produce an effect quite contrary to the farmer's expectation: it muſt therefore be left unemployed one year at leaſt, unleſs it has been qualified with a mixture of chalk; but care muſt be taken not to let it lie unuſed for four or five years, during which it would loſe all its virtue, by the evaporation of thoſe light fine ſalts with which it was impregnated by the water, and nothing but dead earth remain. It ought likewiſe to be obſerved that the mud of ponds, being left to dry, preſents a ſurface mixed with ſand, and a kind of dead clay, which is good for nothing; but this firſt layer being removed, that which we ſpeak of will be found below. This kind of manure, being warmed and rotted, muſt be ſpread equally and pretty thick upon the land, and turned under ground, as ſoon as poſſible, leſt the weather cauſing its light oily parts to evaporate, the vegetative virtue of it, ſhould be enfeebled.

Aſhes. Under this head we mean to ſpeak only of the wood-aſhes taken from chimneys, forges and ovens, and thoſe of coal, earth and turf. Theſe aſhes are particularly excellent for peaſe, vetches and other ſuch pulſe; they are ſcattered or ſown when the plant hath riſen about an inch from the ſurface of the earth; but as their ſalt being very ſharp, would in dry weather infallibly prejudice the tender vegetables, they are

are not uſed until the farmer can depend upon immediate rain to diſſolve and ſoften their acrimony.

Soap-water and ſoap-aſhes. Theſe, according to ſome farmers, are the moſt precious of all ſorts of manure; eſpecially ſoap ſuds, to which may be joined lye-water. What conſtitutes the great virtue of this manure is, that beſides the vegetable ſalts and oils, that enter the compoſition of ſoap, it likewiſe contains the ſalts and oils of the animal reign, that reſided in the linen, which it cleaned and whitened; and theſe laſt perfectly ſoften the acrimony of the firſt. This water ought to be carefully reſerved for gardens, where it will produce admirable effects. As for the aſhes taken from ſoap houſes, they ought to be kept dry, and never carried to the ground until it is on the point of being ſown; then it is ſpread as equally as poſſible with ſhovels; and care may be taken to lay it on pretty thick, experience having ſhewn that the ground is bettered by it for eight or nine years, during which it will need no other dung. If there is not a ſufficient quantity of aſhes, dung may be added to them; but in that caſe, they are not ſo effectual as may be eaſily imagined.

Shells. Some ſpots of earth are filled with ſhells which are for the moſt part brittle, and crumble into white powder, which is an excellent manure, and ſome authors pretend that it renders land fruitful for thirty years. Theſe

ſhells

ſhells are not neglected in Touraine, and the expert farmer who finds ſuch a mine, will not fail to make his advantage of it.

Lime and lime-aſhes. The property of lime ſpread upon the ground, is to deſtroy noxious weeds, drive away inſects, fertilize the earth and keep it clean. The ſeaſon for uſing it, is when the land is ready to receive the ſeed: but it would be dangerous to make uſe of pure lime unſlacked: its extreme heat would dry the earth too much, and do it more harm than good; beſides, a great quantity would be required to cover ground of any conſiderable extent, and the expence of purchaſing, or even of carriage, would render this manure very coſtly. When the farmer has reſolved to fatten the land with lime, he orders it to be brought into the field, or near it, if there is a convenient place; there it is laid in one heap, covered with leaves or chopped ſtraw, two feet high. The top of this heap is opened for pouring in a quantity of water ſufficient to ſlake it, and the ſtraw and leaves are watered on the outſide. The trouble of this operation is ſaved by the falling of rain, and this may be waited for, if the lime hath been conveyed in good time. As ſoon as the lime begins to be heated, the hole above is ſtopped, in order to oblige the ſmoak to attach itſelf to the wet ſtraw and leaves, and whenever this ſmoke penetrates, ſtraw muſt be carefully thrown upon it to concentrate it. When the lime is ſuppoſed to yield no more ſmoke, the covering is pierced

pierced on all ſides; then that which was too dry, totally conſumes, and the reſt is converted into a kind of groſs aſhes. Thus, the heap of lime is at leaſt tripled, its dangerous heat tempered, and the whole rendered more advantageous to the ground on which it is ſpread. Lime aſhes do not require this preparation; but may be ſcattered juſt as they are gathered, with this caution, which is common to all aſhes, namely, to ſpread them equally, and pretty thick. If the farmer, in the firſt year after having prepared his grounds in this manner, does not reap ſuch an abundant harveſt as he had reaſon to expect, he ought not to loſe his patience; the ſecond year will pay with intereſt what the firſt could not afford. When we ſay it is proper to prepare intirely for the ſeed, the ground upon which the lime is to be thrown, we ought to aſſign the reaſon for this precaution, leſt ſome perſon thinking to improve upon our leſſons, ſhould loſe his expence and the fruit of his labour; it muſt be conſidered, therefore, that by ſcattering the lime and labouring afterwards, the ſaid lime will be turned under ground, and its virtue ſtill deſcending, can no longer act upon the ſurface of the earth, which will therefore, continue to be covered with noxious weeds and inſects; and the intention was to clean and meliorate this very ſurface. Wherefore, it is evident, that the ground ought to be entirely laboured, before the lime be applied, that we may be aſſured it will remain upon the ſurface, and there produce the good effects we have reaſon to expect from its quality.

quality. We will add, that no part of the lime may be loſt, the place where it was ſlaked ought to be ſcraped off, and theſe ſcrapings impregnated with the lime, uſed as the lime itſelf.

Blood. It is not a little ſurpriſing that people ſhould ſo much neglect this, which is one of the principal ſpecies of manure. The nature of blood, which is replete with ſalts, oils and ſpirits, ought to have demonſtrated how proper it was to fertilize the earth. Every judicious farmer will, therefore, take care not to loſe one ſingle drop of that which is taken from his beaſts; and even furniſh himſelf with as much as he can procure from the ſhambles, fully perſuaded that this ſmall trouble will requite him an hundred fold, by the fruitfulneſs of the land upon which it is ſprinkled.

The earth of conflagrations and furnaces. By this earth are underſtood the aſhes and rubbiſh that remain after a conflagration or fire, as well as thoſe of old demoliſhed furnaces. This earth will be the better, the more it contains of burnt ſtraw, and the more it is mixed with clay, becauſe the ſoft ſalts of theſe matters will blunt the pungent ſalts of the wood.

The dirt of ſtreets. The goodneſs of this manure conſiſts in its being fat, well brayed, diluted, and mixed with abundance of animal dung, and ſweepings thrown from houſes, abounding with

with things which have the virtue of dung. It ought not, however, to be uſed until ſometime after it hath been collected, when it is thoroughly rotten; and in order to accelerate its preparation, it ſhould be ſtirred from time to time.

Soot contains a very volatile ſalt, and agrees beſt with onions; but with regard to other vegetables, it ought not to be uſed without great caution, on account of its acrimony.

Salt petre or nitre and common ſalt. We might here amply expatiate upon the article of ſalt petre and common ſalt; and we may likewiſe reſtrict ourſelves to a few words. This laſt is the method we ſhall chooſe, contenting ourſelves with obſerving that nitre and ſalt are the moſt efficacious principles of vegetation, and that in them only conſiſts the virtue of all the dung that is uſed: wherefore, all matter impregnated with theſe ſalts is proper for fertilizing the earth.

Scraped earth, or what is collected in yards when they are cleaned, after rain. It is laid in heaps and left ſome time to rot; then being carried to the leaneſt land, it is beaten, and in tilling, put under ground. This manure is ſo vigorous as to fatten the earth for ſeveral years.

Plaiſter and rubbiſh of old houſes. This matter is univerſally thrown away, as abſolutely uſeleſs, into places where it can turn to no account:

nevertheleſs, a prudent farmer will obſerve, that after the bricks, tiles and ſtones are taken away, what remains will be uſeful, as it is a mixture of lime and clay, which hath received the impreſſions of the air, and the exhalations of the earth, during a long ſeries of years; without reckoning the wood, ſtraw, and other rotten matters, which are always found in ſuch places. In thoſe countries, where the earth is impregnated with ſalt petre, as in Touraine, the very ſtones partake of it; ſo likewiſe where plaiſter is common, we ſee it turning into ſalt petre in the lower parts of the houſes: when, therefore, thoſe belonging to the ſalt petre works do not carry it off, it is made uſe of to advantage, in enriching land.

Fragments of ſlate and lye aſhes. When ground that is too fat, wants to be lightened, a better method cannot be taken, than to ſprinkle it with powdered ſlate or lye-aſhes, which ſeparate the clods of earth, and give them air, that penetrating into their interior parts, ſets in motion, and heats the ſalts and oil with which they are replete. For this reaſon there has been for ſeveral years paſt, an eſtabliſhed trade in lye-aſhes, between the ſalt petre works on the banks of the Loire, and the people in the neighbourhood of Nantz, where lands being too ſtrong, need this mixture, which renders them more light, and unbinds their whole fecundity.

Burnt

Burnt ſtubble. The manner of burning ſtubble has been at all times univerſally known, as the certain means of deſtroying weeds and inſects; but it is not without danger. For, if we do not take particular care, in obſerving from what corner the wind blows, we run the riſque of damaging the fruit trees and woods in the neighbourhood. In thoſe countries where the graſs grows ſo thick that the ſheep cannot conſume the whole of it, about the end of autumn, they ſet fire to the dry graſs, that the new may have room to ſprout up in the ſpring; and this is the great reaſon of the aſtoniſhing fertility of thoſe diſtricts. But, in regard to the ſtubble, we ought to add, that divers farmers chooſe rather to turn it under ground with the plough, than to burn it; pretending that by rotting it renders the land more light and fruitful.

Putrified animals. Every body knows what benefit trees receive from animals that are buried at their roots. This is an approved remedy for their diſtempers and barrenneſs; and a certain farmer has propoſed this queſtion on the ſubject: whether, in the mortality of cattle, it would not be proper to make a deep trench, in which all the beaſts that die of the diſtemper, being thrown, ſhould be covered with leaves or ſtraw, if it was in plenty, and over that, with part of the earth dug out of the pit, to the depth of two or three feet; upon which ſhould

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be laid briars, faggots, and other things, to hinder the animals from digging. The carcaſes ſhould be left in this manner, to putrify during ſeveral years, at the end of which the trench ſhould be opened, and the earth to which the bodies are reduced, taken out for manure to the ground. This farmer does not believe that the leaſt veſtige of the contagion that deſtroyed the cattle could ſubſiſt in the matter to which they are reduced, or even in the earth; and imagines that, in order to be abſolutely ſecured againſt every troubleſome conſequence, it would be ſufficient to mix that earth with a little lime. At leaſt, by theſe means a great calamity would be productive of ſome little advantage.

All putrified ſubſtances. Putrefaction is the operation by which nature diſſolves one body for the formation of another; it is therefore eaſy to conceive, that every thing which is putrified muſt favour vegetation; and it is unneceſſary to inſiſt further upon the ſubject.

Urine is full of ſalt and ſpirit; but they are ſo ſtrong and ſharp, that they burn every thing when the urine is employed by itſelf; it is therefore convenient to mix and ſoften it with rain water, and then it becomes an excellent manure.

Wine lees. Of all vegetables there is none more abundantly impregnated with the ſolar virtue,

virtue, than the vine; therefore, the lees which the wine depoſites in the caſk, cannot but be replete with vigorous ſalts and ſpirits: but care muſt be taken, in covering ground with them, that their moſt ſubtile and volatile parts do not eſcape.

Currier-lye, &c. To this lye muſt be added all that comes from tan-works, fulling-mills, dyers vats, and manufactures of wool, as well as all the waſte in dreſſing hides, hair and horns of animals, and leather-works. All that belong to the animal reign is precious in itſelf, on account of the ſalts with which it abounds; and theſe good qualities are augmented by the oil and fat uſed in preparing the greateſt part of it, or in keeping the leather in repair. That old leather, therefore, which is uſually thrown away, ought to be carefully preſerved; and whether ſcattered upon the land, after having been cut in ſmall pieces, or ſteeped and rotted in all ſorts of greaſy and dirty water, ſuch as diſh-waſhings, ſoap-ſuds, &c. kept for enriching the ground, the wonderful effects of it will ſoon appear.

Potters earth is uſually employed on ſandy grounds, and ſuch as retain no water: it binds the earth and enables it to bear.

Pit coal being replete with ſulphur and oil, ſea-ſand and ſea-weed, which abound with ſalts, and all ſorts of ſaline and oily matter in general,

always form an advantageous manure; for theſe ſalts and oils conſtitute all that is uſeful in the ordinary kinds of dung.

Reflections.

Although we have hitherto ſeemed to ſpeak in our own words, we ought to appriſe the reader, that we conform ourſelves exactly to the eſſays of a perſon extremely well ſkilled and experienced in agriculture, who hath reſigned them entirely to our uſe, he himſelf being deſirous of remaining unknown: and the public may be aſſured, that all we ſhall ſay is founded upon the experience of ſeveral years, conſequently deſerves more attention than vague and conjectural reaſoning.

It is no ſmall queſtion in agriculture, to determine where and in what manner the different kinds of dung ought to be collected, until they are carried into the field; for, upon their virtue depends the fertility of the earth. If the dung is not ſufficiently rotted, it cannot fatten the earth, in which it will remain ſeveral years, without being conſumed; if it is too much rotted, it will not increaſe the crop, and generally loſes the greateſt part of its ſtrength. It rots pretty well in the ditches, where it is commonly heaped together; but is apt to turn ſour, and then can be of no ſervice. The beſt method, therefore, ſeems to be to place it on a gentle declivity, that

that the rain water may run off without ſouring it; and to make the dunghill higher than it is broad, that the ſame rain which waſhes and ſcours the ſurface, may not damage it too much. It will be very uſeful to dig ſinks below, and at ſome diſtance from the dunghills, in order to retain the juice, which is precious to every prudent farmer, either for ſteeping his ſeeds before they are ſown, for it is replete with oil and ſalt, for watering his garden, or macerating different kinds of manure, ſuch as leaves, old leather, parings of cloth, &c. or, finally, for facilitating the putrefaction of horſe and mule dung, which are, as we have formerly obſerved, very dry in their own nature.

The dunghill being thus diſpoſed, care muſt be taken to hinder ducks from approaching it, for, with their large bills, they ſuck a conſiderable quantity of the fat from the dung, and make holes, through which it runs, as the dunghill ſinks in rotting. We muſt likewiſe be cautious of loading an old heap with new dung, the weight of which will too much compreſs and ſqueeze out the ſubſtance of the old.

It is neceſſary to make ſeparate heaps of each kind of dung; and likewiſe advantageous to mix them all together, that their different qualities being confounded, may produce a general manure, which may be every where uſed with ſucceſs: but it is difficult, not to ſay impoſſible, to lay

down preciſe rules on this ſubject; the farmer's own diſcretion will prompt him to examine whether or not he has occaſion for any particular dung; and the nature of his grounds, with which he will ſtudy to make himſelf acquainted, will furniſh him with certain rules for his conduct in this article.

There are ſo few countries in which the land needs no manure, that in paſſing over theſe happy regions in ſilence, we do no injury to the rules of agriculture. We ſhall then obſerve in general, that all ground is either cold and moiſt, or hot and dry: upon this ſimple principle, reaſon will induce us to carry hot dung to cold lands, and cooling manure to hot ground; but as there are different degrees of heat and dryneſs, and cold and humidity, it will be neceſſary to proportion the dung to the quality of the ground; and this is done by mixing together thoſe different ſpecies which are moſt agreeable to the ſoil. This caſe is a ſubject of great reflection to the farmer; for, beſides that he cannot exactly know the quality of the ground, but by dint of long experience, he muſt not flatter himſelf that it will remain always the ſame. A rivulet that uſed to run under a field, chancing to change its courſe to the other ſide, is ſufficient to alter that field from moiſt and cool to hot and dry. We mention this example from a thouſand others of the ſame kind, which we might cite, to convince every man who cultivates his land, that

that he ought to be continually attentive to the methods he takes with it, if he would reap the fruits he ought to expect from his labour.

As the ſame grain is not always ſown, ſo neither ought the ſame dung to be uſed upon the ſame ground. This method is founded upon a natural philoſophy, of which it is not eaſy to give a diſtinct idea. We know that the earth and dung are full of ſalts and oils, or fat, of different kinds, and a mixture abſolutely impenetrable to the human underſtanding. But reaſon and experience teach us that they do not all equally concur in the production of fruits. While ſome are in agitation, and exhauſt themſelves, others remain in inaction and are accumulated; for which reaſon the earth ought to be ſowed with a different kind of ſeed, which leaving the weakened ſalts at reſt, attract theſe which they find in vigour and abundance. On the other hand, the earth being too often covered with the ſame dung, is cloyed with a kind of ſalt and oil that predominates in that manure, ſo as not to be able to attract and incorporate them with her own: it cannot therefore but be very advantageous, to furniſh her with a new kind, for her accomodation. For it may be eaſily conceived, that in dunged land, the ſalts and fat of the manure do not act ſeparately from thoſe of the earth, but many unite and incorporate together, by the heat of the earth and ſun, and the action of the air, which penetrating

trating every where, diffuſe through the whole maſs a certain fire and humidity which conſtitute the ſoul of nature.

To the knowledge of the different kinds of dung that agree with different pieces of land, is joined the care of preparing them for the time at which they will be wanted: experience will teach the farmer how long they ought to lie in the ſtall, and afterwards in the air, for their being brought to perfection. When he is afraid that there is not time enough before him, inſtead of making litter of long ſtraw, he will cauſe it to be cut, by which means it will rot the more eaſily.

The dung being carried into the field, is laid in ſmall heaps, at a certain diſtance from one another, before it is ſpread; and the ſpots where theſe heaps have been are eaſily known, in the ſequel, by the beauty and abundance of corn they produce. It is therefore a very prudent method of fertilizing the ground more equally, to multiply the number of heaps, and leave but four or five paces of diſtance between them.

The farmer would be very much deceived, and expoſe himſelf to conſiderable loſs, if, in multiplying, as we have ſaid, the heaps of dung, he ſhould lay on more than the land requires: the corn indeed would ſpring up with great force, but the ears in forming would ſtarve one another; the ſtraw would be weak; the grain ſmall; the wind

wind and rain would eaſily lay them, and they would not be able to riſe without great difficulty. The multiplication of heaps then of which we ſpeak, ſolely conſiſts in making them ſmaller than uſual, that they may be nearer to each other.

If it be dangerous to dung a field too much, it is not more ſafe to manure it too little; therefore when there is a ſcarcity of dung, which is a great misfortune, it is better to ſow no more than a part of the land, which can be ſuitably manured, than to loſe the ſeed upon that which can have none, or to dung the whole ſo ſuperficially that the harveſt will ſcarce defray the expence of cultivation. However, as the loſs is viſible, and attended with great conſequences for the following years, the farmer will in due time take proper meaſures for having a ſufficient quantity of dung, or ſeek for reſources to ſupply the want of it in thoſe fatteners which we have mentioned. We flatter ourſelves with having given a detail of a ſufficient number, ſo as that he may uſe ſome of them to advantage; and we are not without hope, that compelled by neceſſity to have recourſe to ſuch expedients, he will hereafter eagerly execute at large what formerly he may have thought himſelf happy to have tried in little.

The only reaſon for laying dung in ſmall heaps is, that it may be ſcattered more eaſily and equally; and this, though one of the leaſt agreeable works

of

of huſbandry, is nevertheleſs that which in a more eſpecial manner demands the eye of the maſter, and that too of a liberal maſter; for a farmer who is niggardly, either in the wages of his workmen, or in the gratification of his domeſtics, will never ſee his dung ſpread as it ought to be. In effect, it is not enough to ſcatter it with the ſhovel and rake, for it often ſticks together in clots, which ought to be taken up and tore aſunder with the hands; an operation which no labourer will perform, unleſs through a ſpirit of fidelity ſo rare as not much to be depended upon, or from the hope of recompence, or in conſequence of a reaſonable ſalary. However, if the dung is not thus diſtributed, it will not rot in the earth, conſequently cannot turn to account.

As the nature of the ground determines the time when the dung ought to be laid on, ſo the nature of the dung preſcribes the time and manner of putting it under ground. Cold land requires hot dung, which ought to be laid on early, and quickly buried by overturning the earth upon it, leſt it ſhould evaporate; for the moiſture of the earth is ſufficient to finiſh the rotting. To hot and dry lands we apply fat dung, in which we run no riſque by carrying it out late, and leaving it ſome time on the land when it is ſpread, before it is covered. The ſun, by beating upon it, facilitates the putrefaction; it attracts from the air a ſalt and nitre, by which its virtue is augment-

augmented; and it will be ſufficient to till when we want to put it under ground. But, in general, whatever dung is uſed, or whatever the time may be at which it is covered, we muſt take care that it is not buried too deep. It is in the ſurface of the earth that the corn takes root, and there it ought to meet with the aſſiſtance of the dung which is prepared for it.

When the dung is covered, an harrow muſt be drawn over, in order to ſmooth the field; and ſometimes, when the manure conſiſts of long ſtraw, it is caught by the teeth of the harrow, and dragged along; ſo that what was diſperſed, is again left in heaps; in which caſe, ſome parts of the ground are too lean, while others are too fat; when this therefore happens, we ought carefully to take up the harrow and diſengage it from the ſtraw, that the dung may remain in its proper place.

What we have ſaid of dung, may be applied to ſeveral kinds of thoſe fatteners which we have mentioned; but it will be neceſſary to obſerve, that when aſhes are ſcattered upon the land, there is no occaſion to put them under ground: in remaining expoſed to the air, the rain diſſolves their ſalts, which enter into the ſurface of the earth, and there produce that fertility which we propoſe to give her.

All thoſe fatteners cannot be prepared in the ſame quantity; and we are not ignorant, that

many people reject with diſdain what cannot be collected at a ſmall expence, and employed in great quantity: but without examining whether this way of thinking does not proceed from a fund of lazineſs, we will obſerve, for the benefit of thoſe who have but ſmall means, without a number of cattle neceſſary to produce a ſufficient quantity of dung, that in taking advantage of, and reflecting carefully on what we have ſaid in the different articles of this eſſay, they will infallibly, and ſometimes without expence, find means not only to fertilize their gardens without employing their dung, which may be wholly reſerved for their ploughed grounds, but alſo increaſe the ſtrength and quantity of that manure. The narrow bounds of their poſſeſſions, inſtead of diſcouraging, ought to animate them to beſtow good culture upon the ground: they ought to conſider, that people in the midſt of wealth are impoveriſhed by negligence, while the pooreſt are enriched by induſtry and toil. When the Roman republic eſtabliſhed a colony, it aſſigned no more than four acres of land to each ſettler; this moderate portion of ground being deemed by the antients ſufficient to maintain a family; doubtleſs, on the ſuppoſition that it was cultivated by the maſter himſelf, with all poſſible care and attention.

While this eſſay was printing, we received an account of the manner uſed in Languedoc for burning green turf into aſhes for the ground. As

As we have already deſcribed that ſort of manure, our article may be compared with this new account, and the reader will ſee what diverſity the difference of climate makes neceſſary, in an operation which is at bottom the ſame, the one method being practiſed in a cold, and the other in a warm country. We will add, that in Lower Poitou, and in ſome other places, the turf is diſpoſed in form of a cone or round pyramid, and the ovens built of it are very ſmall.

Burnt turf of Languedoc. From the month of Auguſt, until hindered by the rain, the farmers cut the turf in pieces of one or two feet ſquare, from two to three inches thick, from the borders of labourable ground, in ditches or croſs roads covered with graſs: after having let them dry, by being expoſed to the ſun for one or two days, they are gathered together in form of furnaces, round one or two faggots of wood, a very ſmall opening being left or made to windward, for ſetting fire to this wood, which is no ſooner kindled than the opening is ſhut up with the ſame kind of turf: wherever the ſmoke iſſues with the greateſt force, they add other turfs, to an heighth and thickneſs relative to the manner in which the combuſtion ſucceeds: this they call ſerving the furnaces, till they being ſufficiently fortified, nothing more is done, unleſs a blaſt of wind or other accident ſhould render ſome repair neceſſary. Thus they are left to ſmoke, calcine and pulverize. When the ſmoaking ceaſes, the aſhes are

ſpread

ſpread upon the neighbouring ground, and a new furnace is made of that which was not ſufficiently calcined. This is the moſt effectual manner uſed in that country of fertilizing labourable ground for a ſeries of years, eſpecially if they happen to be rainy; and it is thus that waſte ground is cleared. Lands, on account of their too great moiſture, are left to run to waſte for ſome years, at the end of which they are cleared: when the ſurface is loaded with graſs, bull-ruſhes and bruſh-wood, that ſaves the expence of other wood for the furnaces.

In order to fatten the ſtrongeſt and beſt grounds, they leave them untilled after harveſt, ſow or ſprinkle them with the duſt of hay granaries, and let them bear all ſorts of graſs during the ſpring: this is a paſturage proper for fattening large cattle during the months of May, June, and even July, if the rains preſerve the freſhneſs of vegetation. It is likewiſe proper food for ſheep. At length, in Auguſt, the ſurface is pared in pieces of turf, and of theſe furnaces are made for the aſhes, which are ſcattered in the manner we have already deſcribed.

Of

Of the MILDEW that falls upon HOPS, and ſeveral METHODS for preventing the bad effects of it.

THIS is a white dew, that falls in ſummer at ſun riſe, when the rye is ripe and the hops are in flower. The fall of it is ſo unequal, that ſometimes it embraces a whole diſtrict, and ſometimes only ſome parts of it. This dew dries the hops, withers and conſumes the leaves, and conſequently ruins the crop. There is no other remedy from nature againſt this miſchance, except rain ſufficient to waſh the plant, and clear it entirely from this fatal dew; but as rain very ſeldom comes ſo ſeaſonably to the relief of the plant, artificial means have been ſought, for enſuring it againſt this accident. Some have ſurrrounded their hop-grounds with hog-dung; others have employed perſons to go through the ground with veſſels full of beech aſhes, and throw them upon the hops while the mildew was falling; and both ſides profiting by their experience, pretend to have found a ſpecific preſervative againſt the bad effects of the mildew; they have even proceeded ſo far, as that each ſide affirm their's to be the only remedy. Thoſe who uſe hog dung ſay, that the aſhes may probably hinder the action of the dew upon the plant; but at the ſame time, muſt ſtop up its pores, and deprive the ſoil of its hu-

midity,

midity, a circumſtance equally ruinous to the plant; beſides, that beech is not every where to be found, and if it muſt be brought from far, the remedy would in ſome meaſure become impracticable by the dearth, and difficulty of procuring it. As for the partiſans of the aſhes, they ſay, they cannot comprehend how hog dung diſpoſed round the hop ground in the ſpring, ſhould preſerve ſuch virtue as to deſtroy the bad quality of this mildew in the ſummer. And to render this diſcuſſion compleat, each ſide pretends that the trials they have made of the other's remedy did not ſucceed.

This diſpute, ſo intereſting to the provinces where beer is the common drink, excited a naturaliſt to examine the nature of this mildew; and by the aſſiſtance of a microſcope, he perceived it to be a collection of the eggs of little inſects, that fly in vaſt quantities in the air while the hop is in flowers. Theſe inſects gnaw the leaves and trees, and like others of that ſpecies, undergo various metamorphoſes. This diſcovery induced him to believe, that as inſects do not generally attach themſelves to trees full of ſtrength, or vigorous plants, but only to that which is feeble and ſickly, (they being endued with ſuch delicate ſenſations as to diſtinguiſh by the ſmell the exterior malady of the tree and the plant, even while externally they ſeem to be in good caſe) the hog dung might probably give ſuch vigour to the hop, that theſe little animals are afraid to attack it:

it: for it will be proper to obſerve, that the inſects which nip a leaf, leave it as ſoon as they find an abundant juice, the ſalts of which doubtleſs incommode them, and they fix only on thoſe which begin to wither and loſe their ſap. Aſhes may likewiſe have the virtue to hurt them, and its ſalts be capable of giving them diſturbance. But late experience hinders us from giving entire credit to theſe two remedies, and ſhews, that if they have ſometimes preſerved the hop from the effects of the mildew, we are not to conclude that they will always anſwer. A certain philoſopher, who was likewiſe a good œconomiſt, ſaw his hops ſpoiled by the mildew, notwithſtanding the dung with which they were ſurrounded, and the aſhes which were thrown upon them: in a little time the leaves of the plant were covered with a million of ſmall white inſects. The aſhes indeed ſeemed to kill them; but, as we have obſerved above, they at the ſame time deprived the ſoil of its neceſſary moiſture. Deſirous of ſaving his hops, he recollected an axiom in medicine, importing, that bitterneſs kills worms: *Amarum necat vermes.* He ordered then a quantity of wormwood to be bruiſed, and having infuſed it in water, he ſprinkled his hops with the infuſion by means of a fire pump; but he was too late; the hops were already deſtroyed. It is a very mortifying circumſtance, to loſe a crop on which one had reaſon to depend. This afflicted œconomiſt, deſirous at leaſt of aſſuaging his grief by communication, recounted to a clergyman his

neighbour, a perſon of condition, well verſed in all parts of country œconomy, the accident which had happened to him, and the fruitleſs care he had taken both to prevent and remedy the misfortune. The clergyman anſwered, that when ſuch a miſchance happened to him, he, without giving himſelf ſo much trouble, ordered his people to ſtrip off immediately all the leaves of his hops; and that the ſtalks puſhing out other leaves, he had at leaſt one half, and ſometimes two-thirds of his ordinary crop.

Of

Of HOPS.

Confirmation of the uſefulneſs of Hog's Dung againſt the Mildew. Uſe of the Leaves and Sprigs: together with ſome Remarks upon the Improvement of Hops.

WHAT we publiſhed in our Journal of January concerning hops, hath excited a ſkilful farmer to communicate his experiments on the ſubject. The reader will perceive by the extract of his letter, which we are impatient to publiſh to the world, the obligations that are due to him from all thoſe who cultivate hops, and the credit he deſerves in every thing he advances.

I was informed ſome years ago, that hog's dung might be employed to great advantage in hop-gardens; nevertheleſs, as I could not penetrate the reaſon of the advantage which the hops derived from that ſort of dung, I gave myſelf no trouble hitherto in employing it preferably to any other: but having loſt this year almoſt all my hops by the mildew, and having obſerved but one ſingle place where the fruit remained entire and in a perfect ſtate, I found, upon diligent enquiry, that my ſervants had laid hog's dung in that diſtrict, preciſely where the mildew had

not injured the fruit. I am therefore convinced of the good effects of this dung in hop-gardens, and the more, as I am certain that my land was prepared with dung of all ſorts. The farmer then will find his advantage in employing for his hops only all his hog's dung, which, beſides, is very little ſerviceable for other country uſes, and in covering the hop trenches both in autumn and ſpring with the ſame kind of dung raw, before it is rotten.

When hops are ſcarce, the leaves and ſprigs ought to be gathered for very uſeful purpoſes; but they muſt be gathered with great care: no leaves ſhould be taken but ſuch as are clean, young, whole and green; and only the tips of the ſprigs that are green, young and full of juice. They muſt be dried in a very clean and airy place.

Theſe may be uſed in brewing for an after-beer, or thin ſmall beer for ſervants; for by throwing in the leaves and ſprigs of hops, that ſmall beer acquires more force, becomes more wholſome, and will keep longer. It is even evident, that in years when hops are dear, one half may be ſaved by this means for the ſtrong beer: ſurely, therefore, it is well worth the while of brewers to try the experiment.

The leaves and ſprigs of hops are, during the exceſſive colds of winter, an excellent cordial to cattle, whom they ſtrengthen prodigiouſly. The

method of uſing them is to infuſe them in boiling water, and to pour the infuſion into the ordinary drink of the cattle.

Cattle may be ſtill more fortified, by mixing with their drink pine-tops or fir-tops; and to render theſe more efficacious, it is proper to boil them in a kettle, that all the reſinous ſubſtance may diſſolve, and to pour the extract into their drink. I had the misfortune in my little eſtate, which is ſurrounded with mountains, that by a prodigious cold ſome of my cows had the marrow almoſt frozen in their bones; ſo that in ſpite of the beſt fodder that was given to them, they lay upon the ground, and could not uſe their limbs or riſe up. I can aſcribe to nothing but to the remedy which I have juſt now pointed out, the ſurpriſing cure of theſe animals. In one month's time they were ſo well recovered, that they roſe without any aſſiſtance, and ever ſince they have reſiſted the moſt violent cold without being the leaſt affected. The ſingularity of this effect determined me to impart it to you, that every body upon occaſion may have recourſe to the ſame remedy.

With regard to the augmentation and improvement of the fruit of hops, I ſhall delay treating of them more at large, till my experiments be more advanced, and till I can ſay ſomething deciſive on the ſubject.

While we expect this ſagacious farmer's new diſcoveries upon the improvement of hops, we ſhall ſubjoin here remarks that have been ſent to us upon the ſame ſubject by another hand; and we intreat thoſe who think proper to put them in practice, to inform us afterwards of their ſucceſs.

As ſoon as the ground is ſoft enough to be opened, the old ſtocks of the hops ought to be cut, in order that young ſhoots may ſprout up; for we are aſſured the froſt doth no harm to this plant. When it is to be dunged, two trenches ſhould be made at the diſtance of two paces one from the other, as in vineyards; and theſe ſhould be filled as much as poſſible with hog's dung; the roots of the hops will enter there, and extract more moiſture and nouriſhment than from any other ſort of dung. But the greateſt advantage is, that by following this method there is no neceſſity of dunging the hop garden oftener than once in three years. The plant itſelf hath no need of dung; none ſhould be put round it; it ſuffices only to throw in a little early in the ſeaſon. We know by experience, that a perſon who cultivates his garden in this manner has always better hops than his neighbours, although his ſoil is much inferior to their's.

To uſe too long poles for hops is an error which ought to be corrected; for though the ſprigs are longer, and the leaves in greater abundance,

dance, it is manifeſt, on the other hand, that leſs fruit is to be gathered from them. In the very beſt ſoils, therefore, the poles ought not to exceed twelve feet in heighth, and in worſe ſoils, ten feet are ſufficient. If the ſprig mounts higher, it muſt be beaten down with a rod, that it may not grow higher, and that the plant may give more fruit; even the fruit will be finer, if the leaves are ſtript off at the height of four or five feet. A fact which is confirmed by experience.

When a hop garden hath been a long time employed, and you perceive that ſome plants periſh and rot every year, the ſhorteſt and moſt advantageous method is to plough up the garden entirely, after having grubbed up the hops. You may ſow whatever grain you pleaſe, and where it is reaped, you muſt plough the garden a ſecond time in autumn, that the rain may penetrate and moiſten the earth, and the ſpring following you may make a new plantation of hops.

The good hops are diſtinguiſhed by the quantity of yellow meal in the heads; when they are clammy and greaſy to the touch, and when, being rubbed between the hands, they caſt a ſtrong ſmell.

LETTER to the Editor of the Journal OECONOMIQUE, concerning the uſefulneſs of the Plant NUMMARIA againſt the Worms that deſtroy Corn.

THE firſt volume of your journal having fallen into my hands, it was with pleaſure I obſerved, that you aſked every honeſt man to aſſiſt you in executing the plan you had propoſed. The undertaking is ſo uſeful, that I doubt not of your receiving from it all the ſatisfaction imaginable. For my own part, I am impatient to impart to you what chance and experience taught me ſome years ago, touching the virtue of a plant which hath delivered me from the white worms that ſwarmed among the corn in my granaries. Although I muſt beg you to ſuppreſs my name and place of abode, I ſhall, nevertheleſs, have a ſecret pleaſure in being one of the firſt who have entered into your grand project for the public good.

This plant, to which I give the name Nummaria, muſt not be confounded with the Nummularia, ſo called on account of the figure of its leaves, which reſemble a farthing, and which is known in medicine by its aſtringent quality. That of which I treat hath a quite contrary effect. I would claſs it, however, with the ſhepherd's purſe, burſa paſtoris, two kinds of which are deſcribed

ſcribed by botaniſts, namely, the large and the ſmall. I dare not affirm that it is of the large kind; but I am certain it is not of the oblong kind of burſa paſtoris minor.

The plant Nummaria grows naturally in cultivated or uncultivated fields, but eſpecially in thoſe where white turnips have been ſowed. It may be planted likewiſe with great ſucceſs, and in a good ſoil becomes taller and ſtronger than when it grows wild in the fields. It riſes commonly a foot and a half high, with three, five, ten, or fifteen branches; but I have found one in my kitchen garden three feet and an half high, with 181 leaves, which contained 511 grains of ſeed. The leaves of this plant lie two and two together, and are rolled up in ſuch a manner, as to have the middle of a little bag which they form elevated. In this little bag is contained the ſeminal grain, which may be ſeen and counted when the leaves are ripe, becauſe then they are yellow and tranſparent. The grains are in number from ſix to eighteen, ſomewhat ſmaller than turnip ſeed: they appear through a microſcope lengthened and broad, furrowed, and of a darkiſh brown colour. They give oil, although one-third leſs than the like quantity of lin-ſeed. In fine, the plant, the leaves, and the ſeed, caſt an intolerable bad ſmell: the oil is ſtinking, and my ſervants are always out of humour when I order them to burn the oil extracted from the Nummaria.

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The Nummaria appears in May, and is ripe about the middle of June. In its maturity, the leaves open and ſcatter the ſeed; wherefore, in order to make a proviſion, it muſt be gathered a little earlier. By cultivating it, you may have it twice a year, if it is ſown in March, and in the end of June; and this is very often neceſſary, becauſe it doth not grow every year. It loves a particular temperature of air, of which I have no certain knowledge; but I am poſitive, whenever it begins to grow, it muſt not be diſturbed by any tillage; the more the earth about it is turned up, the more its maturity is retarded.

Upon examining the grain of the Nummaria, I found that it contained an oil. It happened, that in 1741 I ſowed about four acres of ground with turnips, not one of which grew up; but then, inſtead of theſe I had ſuch a prodigious quantity of the Nummaria, that one would have thought my land had been ſown with it. To make amends in ſome meaſure for the loſs of the turnips, I reſolved to gather the Nummaria, and extract its oil. Accordingly I cleared the ground entirely of this plant, of which there were ſeveral waggon loads, and piled it up in my granary. In two days time it heated, for which reaſon I ſpread it out as much as was poſſible, that it might dry more eaſily; and afterwards it was threſhed. It is not poſſible to conceive what an abominable ſtink it ſpread, not only in the granary, but alſo in

in the contiguous buildings, and even in the court yard; it was inſupportable.

Several years before, ſome rye full of white worms had been laid up in that granary: they were in ſuch vaſt numbers, that at the uſual ſeaſon of the metamorphoſis of inſects, they crawled out of the heap, which they covered in ſuch multitudes, that with a rake they were gathered in buſhels; and yet, notwithſtanding, the heap of corn ſeemed overſpread with a yellowiſh living matter. When ſome time after the rye was carried away, the vermin did not abandon my granary; they had made a lodgment there, and in ſpite of all my efforts, and all the remedies I could procure, I could never exterminate them. The new corn brought in was always found, in four and twenty hours, covered with a white web, formed of the kind of ſilk which is ſpun by that vermin.

Diſheartened by a thouſand expenſive and unprofitable projects, I became accuſtomed to that diſagreeable object. I was even ſo indifferent, that when my granary was emptied of the Nummaria, and the rye was carried off, which I had ſeen before covered with white worms, I imagined, as none appeared at that time, that their metamorphoſis had been advanced by ſome cauſe to which I was a ſtranger. Upon reflection, however, I conceived ſome ſuſpicion of the ſmell of the plant, and I reſolved to make the experiment

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the firſt opportunity that ſhould offer; and indeed it was not long till one preſented itſelf.

The following year, that is to ſay, in 1742, I had ſome corn brought to me full of white worms: immediately I ordered the Nummaria to be ſought for; and as only a ſmall quantity of it could be gathered, I commanded a ring or circle to be made with it round the heap of corn, which was very conſiderable. It was trod upon, that it might diffuſe the ſmell more ſtrongly, and the ſucceſs juſtified the idea I had conceived: the white worms diſappeared, and ſince that time, I have never perceived one in my granary. All my neighbours, to whom I communicated the diſcovery, have reaped the ſame advantage from it; and it is with pleaſure I impart it to you, that the whole kingdom may be indebted to you for the ſame obligation.

As theſe worms are not found in all countries, every body is not acquainted with them; and amongſt thoſe who are, perhaps there may be ſome, who in order to get rid of them would ſcarce expoſe themſelves to the nauſeous ſtink of the Nummaria; for we muſt acknowledge, that vermin deſtroys the corn but very little. Theſe worms never attack it on the ſide of the ſhoot; they conſume but a fifth part of the flour, and never communicate to it the leaſt bad taſte. The corn therefore, if ſown, grows as well, and produces as plentiful a crop as any other; and if ground

ground into flour, gives as good and as nouriſhing bread as one can deſire, without the leaſt danger to the health; a fact of which I am well aſſured by my own experience. But, beſides that they diminiſh the quantity of the corn, they give it ſo diſagreeable a colour, that it is a difficult matter to ſell it. The gain, therefore, is evident in exterminating and deſtroying them by a cheap and infallible remedy, far ſuperior to others, which are often expenſive and ineffectual.

I forgot to inform you, that the oil, the remaining ſubſtance after the oil is extracted, the leaves, the branches, the trunk of the Nummaria, are ſeverally endowed with the ſame virtue as the whole plant, becauſe they preſerve the ſame ſmell. I experienced this with one of my neighbours, in a year when that plant failed entirely. I ordered ſome to be boiled in water that diſtilled from a dunghill, and after removing the wheat, we ſprinkled plentifully the place where it had lain. When that place was well moiſtened, we let it dry, and afterwards put the wheat upon it. We waſhed in like manner the ſecond place which the wheat had occupied. In three days time no maggots or worms were to be ſeen.

The black worm, which gnaws the corn entirely, leaving nothing but the bran, is far more dangerous. I am not certain if the Nummaria deſtroys that inſect or not, having never made

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the experiment; but I am inclined to believe, that it is an enemy to all vermin, for I never could perceive a caterpillar upon its leaves; and it is very probable, that with the white it deſtroys alſo the black worm, caterpillars, bugs, wood-lice, wevils, and a multitude of other inſects, which infeſt and conſume our moſt valuable effects.

QUERY

QUÆRE concerning the SHOOT contained in GRAIN.

ALthough for the moſt part a grain produces but one ſtalk, nevertheleſs it is not uncommon to ſee ſome that produce a much greater number, and a grain of corn may ſerve as the moſt familiar example of this truth. Without having recourſe to extraordinary multiplication, it is certain that from one grain of corn planted in the ground, there ſprout out ordinarily four, five, and ſix ſtalks or ſhanks. It is the principle of this fecundity which we require of naturaliſts, not out of vain curioſity, but becauſe, being once known, it may conduct us to the moſt eaſy and certain method of promoting the fecundity of grain to its utmoſt extent.

Three different opinions divide the naturaliſts. Some of them think that every grain contains but one ſhoot, in which is incloſed all the future plant, with the fruit it is to carry: that each grain of that fruit in like manner contains a ſhoot, where the ſame plant is again found with its fruit, which is the ſame as the foregoing, that is to ſay, is provided with a ſhoot, comprehending a perfect plant, and ſo on *in infinitum*: in this caſe, then, the production of ſeveral ſtalks, is nothing elſe but the ſucceſſive

unfolding

unfolding of the ſhoots that lye piled upon one another.

Others believe that there is in every grain of corn a parcel of ſhoots, which ſprout out in greater or ſmaller numbers, according as the firſt ſtarve the others, by abſorbing the nouriſhment afforded by the earth. Of this opinion is the author of Nature diſplayed, (Tom. II. page 292.) convinced, ſays he, by the number of ſtalks ariſing from the ſame grain of ſeed.

In fine, a third party maintains, that theſe grains are hermaphrodites; that there is but one ſhoot which ſcatters the ſeed; and an infinite number of matrices that open for its reception.

Now it is upon theſe three opinions, we intreat the learned, to communicate their thoughts for the good of the public. The connexion of this queſtion with agriculture is apparent. If the truth is found on the ſide of the two firſt ſyſtems, it will be more eſſential to prepare the land than the ſeed; becauſe if the nouriſhing juices ſufficiently abound, the ſhoots will either unfold, or ſprout up in great quantities. If, on the other hand, the third is the moſt probable, it will be more neceſſary to prepare the ſeed than the land, in order to fortify the ſhoot, and warm the matrices, which will open in greater numbers, as the vigorous ſtalks which ſpring up, will not fail to extract from the earth, and the

air, the ſuccours neceſſary to bring them to perfection. However, what we have advanced concerning the preference of preparing the land, or the ſeed, muſt not make us conclude, that the preference granted to the one, excludes all regard for the other; on the contrary, it will be uſeful to neglect neither, at leaſt until a clear, evident, and inconteſtable deciſion, informs us which of the two we ought to make the principal object of our attention.

The ANATOMICAL DESCRIPTION of a GRAIN of CORN; and the Vegetation of that Grain.

THE cultivation of corn being the chief care of farming, and an object of the utmoſt conſequence to a ſtate, too much pains cannot be taken to inſtruct thoſe who make it their buſineſs. We imagine, therefore, it will be no ſmall aſſiſtance to them, in the direction of their labour, and in all probability redound to their advantage, if we explain to them the interior parts of the ſeed, which they commit to the earth, and the order which nature obſerves in fructifying that ſeed. For it is plain, that without this knowledge, they muſt conduct themſelves at random, in a blind method of practice,

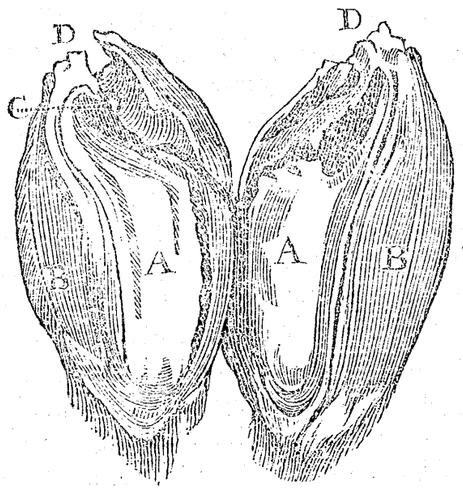
 which

which the leaſt obſtacle will embarraſs, and the firſt accident intirely confound. But, by knowing what the ſeed is in itſelf, and the manner in which it vegetates, they will be more capable of reflecting upon what will be hurtful, or advantageous; they will prepare againſt the firſt, and yield more attention to the laſt: and the light of natural knowledge, diſſipating one part of the darkneſs that ſhrouds hereafter, whatever may be the event, the farmer will neither be perplexed with too great abundance, nor ſurpriſed by the inconvenience of a dearth. We therefore hope, that the public will receive with pleaſure what we now offer upon ſuch an intereſting ſubject.

A grain of corn contains. 1. A farinous or mealy ſubſtance. 2. One or more pellicules or membranes, that ſurround the meal. 3. The ſhoot, in which reſides the whole multiplying virtue of the grain.

The farinous ſubſtance is compoſed of ſmall veſicles, or bladders, and being moiſtened in the earth, ſerves for nouriſhment to the ſhoot, until three green leaves appear, at which period it begins to draw its nouriſhing juice by the root. As this moiſtened farina, or meal, affords the firſt nouriſhment, the peaſant with reaſon calls it, the milk of the plant. The farina of all corn, is inveloped with two brown membranes, between which

which there are ſmall ſubtile veſſels, that go to the ſhoot. Where the crack or cleft is, in the middle, the external pellicle forms a pretty large pipe, which may be termed the great artery. Above, where the grain when in the ear has been expoſed to the open air, we ſee in rye and wheat, a kind of ſmall platform, penetrated with ſeveral ſmall holes, or pores, by which the moiſture is conveyed to the farina, which it changes into a ſubſtance that reſembles milk. In barley and oats, the two brown pellicles are covered with an hard cruſt, which may be ſeparated, as well as with another ſmall, though pretty ſtrong membrane, forwards on the ſide of the cleft. The ſhoot is ſituated in the extremity of the grain, which is ſhut up in the ear, and may be diſtinctly perceived, when the grain is cut with a pen-knife, according to the length of the cleft. Here is a drawing of it, taken with all poſſible exactneſs, as it appeared in the new microſcope, preſented to the academy of ſciences, by Mr. Magny, with an inſtructive eſſay on that inſtrument, of which we hope we ſhall ſoon be able to give an account.



A. The farinous matter. B. The firſt of the pellicles that invelop the farina. C. The ſhoot. D. The origin of the firſt three leaves.

This drawing is reduced to the quarter ſize of what it appeared in the microſcope, furniſhed with the weakeſt lens of an inch focus. In thoſe ſeeds which appear in bags or cods, the ſhoot is always found in that point by which it hath been buried in the earth, and ſeems to be compoſed of roots, two ſmall leaves, and an eye. Beſides, it ſeems to lie in an oval matrix, which may be a glandular tiſſue, in which is performed the ſecretion of the milk, which aſſumes the form of nouriſhing juice, and is conducted from thence into the eye. The ſhoot may be diſcovered three different ways: firſt, by taking from the

the ear, a large grain of rye, when it is ſtill green, although perfect; nicely taking off the ſkin from the point, and examining the ſhoot through the microſcope: at the lower part of the point appears a kind of big-bellied buckler, with three or four knots, from which the roots iſſue. And here it will not be amiſs to obſerve, that when the corn is threſhed in the barn, this ſmall part is wounded, ſo that the grain will not ſhoot forth, but die in the earth. The part where the eye is, we find a little bent, and the leaves riſe to a point, like a flame of fire. When we lay hold on the ſhoot, with a ſharp pointed pin or penknife, it is eaſily ſeparated from its matrix, and when exactly obſerved, appears of an oval form. Secondly, if we cut the grain of corn, (as we at firſt obſerved) according to the direction of the cleft we ſee on each ſide, the edge of the matrix, and ſhoot which is divided. Thirdly, by examining a plant of corn, which hath puſhed forth four leaves, or more, the huſk of the ſeed being ſtill attached to the root, when this huſk or ſhell is taken off, we ſee the matrix of the ſize of a ſmall lentil.

This deſcription of the grain of corn, plainly demonſtrates the reaſon that hinders the injured ſeed (namely that which is bruiſed, ſpoiled by the worms, or otherwiſe) from puſhing forth its ſtalks, as it naturally ought to do. When the internal ſtructure is diſordered, ſo as that the firſt moiſture cannot penetrate to the ſhoot, becauſe

the conduits are broken or obſtructed, the ſaid ſhoot cannot poſſibly thrive. But when the eye that confines it, is ſound and intire, it is of little conſequence, whether or not the farina hath ſuffered; for though little remains to form the firſt milk of the plant, the ſhoot will not fail to puſh out its roots. This is likewiſe the caſe when the corn, while green, ſuſtains bad weather; provided the grains are near perfection, the ſhoot which is firſt formed, after the corn is blown, comes to perfection before the farina, and acquires a degree of ſtrength, which bad weather cannot overcome. Wherefore great care ought to be taken in chooſing the ſeed, with reſpect to both theſe particulars.

The ſeed being ſown, is penetrated by the moiſture, in the ſhort ſpace of one or two days; when it ſwells, and the ſhoot begins to put forth. That part of the ſhoot, oppoſite to the point of the grain, at the extremity of which it is placed, produces the root of the plant, and the ſtalk riſes from that part, which is turned towards the inſide of the grain. Hence it happens, that when the earth has little moiſture, the ſeed riſes ſlowly; but the root that firſt ſprings, and with its threads or fibres immediately faſtens in the earth, fails not to thrive, and the corn, in this caſe, is generally better than when the ſtalk is formed, and the root comes forth nearly at the ſame time; becauſe the root extending, and multiplying, is capable of furniſhing the plant with a greater

greater quantity of juices and aliment, than that which it can afford, when its ſtrength is exhauſted, by the ſtalks riſing too early.

One ſtalk is all that ſprings immediately from the grain; but on the ſide of this principal trunk, towards the lowermoſt knots, iſſue ſeveral lateral tubes or ſtalks, which are either very near, or altogether within the earth. Some of theſe ſend forth roots, from whence one or ſeveral other ſtalks may put forth, provided they are early formed, that the ground is ſoft and fat, and the weather favourable.

Every ſtalk is compoſed of three principal parts, namely, the root, the ſeveral ends of the ſtalks, and the ear. The root is, at firſt, ſurrounded by a purſe, which it burſts when the milk contained in the grain is exhauſted, and the young plant requires more ſolid nouriſhment. Some days after, two other roots ſpring from the ſides, and faſten in the earth. Mean while the firſt bud is formed, being covered with a brown-iſh leaf, and is ſoon followed by ſeveral others. Between theſe buds, are formed the different parts of the ſtalk, terminated by knots, or buttons, to which are fixed the leaves that prepare the nouriſhing juice, for lengthening the ſtalk, and maintaining the ear, until the plant ſhall be blown. We find within, almoſt every where, at the ſides of the ſtalk, but chiefly towards the knots, a white, ſpungy matter, which is to be con-

conſidered as the marrow of the plant. In the ear the knots are more cloſe, and from theſe knots, and the capſulæ or caſes of the ſeed, which is formed from them, we ſee at length, the flowers and fruit proceed. With regard to theſe capſulæ, we ought particularly to obſerve, that they are formed of two ſmall leaves, and anſwer three different purpoſes; to prepare the juice, like the leaves at the knots, to form the fruit, of which they are the moulds, and to defend it againſt the wind and injuries of the weather. But it will be proper to enter into a larger detail, and to examine ſucceſſively, all that paſſes in this admirable production of nature.

When the ſhoot begins to puſh forth, the roots appear like ſmall white threads, attached to the extremity of the grain; the little browniſh leaf, in which the firſt eye or bud is wrapped up, extends and becomes larger; and, provided the grain is not buried too deep in a good ſoil, a ſecond bud ſoon appears, covered with a green leaf. The leaf of the firſt bud, fades as ſoon as the ſecond draws enough of nouriſhment from its green leaf, to puſh out a third bud, which is likewiſe wrapped up in a covering of the ſame colour. Hitherto the milk in the grain is ſufficient, while the root begins to put on a brown appearance, and furniſhes ſufficient nouriſhment to the plant, for the formation of the firſt knot, between the brown leaf, and the firſt lateral ſtalk, ſo as that it has no communication with the principal

cipal ſtalk: and this is likewiſe the caſe with the other lateral ſtalks. It muſt be obſerved, that two leaves always contain two buds, which ſeem to form but one, while they are near each other. As ſoon as thoſe below are ſeparated, a part of the ſtalk riſes between them, having two knots and one root: Then the lowermoſt leaf withers and periſhes, being no longer uſeful, as the roots are now capable of themſelves, to nouriſh the plant.

What we have ſaid concerns the grain which is not too far in the earth; when it is buried deep, vegetation is performed in this manner: The firſt knot has very few roots, and theſe very tender. It puſhes forth a ſtalk, which is often long enough, though weak; at the upper end of this appears another bud, with its leaf; but the browniſh leaf periſhes in the earth. If the ſoil is fat and light, the plant or herb begins to form at the ſecond bud, and in the principal ſtalk, puſhes forth the third, fourth and fifth bud, &c. Then it happens, (a circumſtance which we could ſcarce believe, without the evidence of our own eyes) that one grain of ſeed, buried deep in a fat and light ſoil, ſometimes produces two or three different plants. For the third bud, having puſhed out a fat, ſhort ſtalk, a plant is formed from the ſecond bud, which being ſtill far enough in the earth, and the little fat ſtalk which it puſhes out being ſufficiently ſhort, the ſame thing happens to the third bud,

and

and ſo on, as long as the buds remain under ground. Nay, it has been known, that in ſoft and fat ſoils, the ſhoot hath formed a plant, at the ſame time that it puſhed out its firſt ſtalk; a circumſtance that plainly diſcovers an inconceiveable fruitfulneſs in the corn, which requires no more than pains and application, to enrich the huſbandman.

The plant or herb of the corn, is compoſed of the principal ſtalk, the lateral ſtalks, and others, which theſe laſt have produced in their turn. It begins to form as ſoon as the four green leaves appear: If, at that time, a plant of corn be pulled up, and the lower ſhoot be ſtripped down, or nicely taken off, we uſually perceive, in the midſt of that leaf, a ſmall whitiſh ſpeck, which is formed ſucceſſively into the ſtalk, and its root under the firſt leaf that afterwards appears. This ſmall point comes from the marrow of a knot, and being unfolded in green leaves, when the ſeed hath been early ſown, puſhes out another on one ſide; ſo that, in warm and dry harveſts, a good number are formed, almoſt all of them maintaining themſelves, and thriving in the winter, and multiplying conſiderably in March, April, and May, when the weather is warm and favourable, and the land well manured. Yet, all theſe points, or the ſtalks that are formed from them, do not bear fruit: many of them continue backward, and wither in June and July, eſpecially when the weather is dry, between the months of May

May and July. When the principal ſtalk runs to grain, a great revolution happens in the plant, the nouriſhing juice which it contains being now wholly employed in the formation of the flowers and fruit.

But before this comes to paſs, and when the plant receives its firſt growth, we ſee the leaves of the knots raiſed above the earth, extending themſelves conſiderably, to the number of four, five or ſix. They prepare the nouriſhing juice of the plant for the ear, which is found already formed in miniature, when a ſtalk is ſplit in the ſpring, long before it runs to grain. It is even perceiveable in the autumn, in form of a ſmall cluſter, while the knots are ſtill very near one another. When the tranſpiration of the plant is happily performed, by means of favourable weather, the leaves are of a duſkiſh green, and become fat and full of ſap; the lower knots aſſume a green colour, tending to yellow, and harden by little and little; while in the middle, and above, they remain tender, until the huſk or covering of the ear appears. On the contrary, it is a bad ſign, when theſe lower knots redden and grow hard too ſoon; when the leaves grow yellow before the time, or become of a graſs-green colour, having a pitiful, mean aſpect, with ferrugineous ſpots, that is, ſpots reſembling the ruſt of iron. Theſe defects are either occaſioned by too much moiſture, or too great drought; they may alſo proceed from the leanneſs of the

ſoil,

ſoil, the weeds that prevail in it, hoar froſts, or hard froſts, that continue too long in the ſeaſon; and frequently, they are attributed to a quantity of flies and worms, that draw their nouriſhment from theſe leaves upon which they ſwarm.

When the plant runs to grain, the two upper leaves of the ſtalk are exactly cloſed, one againſt the other, and preſciouſly preſerve the ear until it attains to a certain ſize. 'Till that period, all the knots are at a ſmall diſtance from one another, eſpecially the two laſt, which are intirely ſoft, and the different parts or diviſions of the ſtalk are very ſhort. But ſoon as the ear hath pierced its covering, all theſe diviſions lengthen, and the low leaves furniſh them with the neceſſary nouriſhment, of which they are full; the knots afterwards harden, and the leaves fade, after having changed their figure. Yet the two leaves that formed the covering of the ear, remain for ſome time ſtill green and full of juice, their knots being ſoft and near each other. But when the ear hath intirely come forth, and acquired nearly its full length, (which often happens in ſix or eight days) theſe leaves become gradually of a graſs-green hue, and retain but little of the juice, which henceforward paſſes more abundantly into the ſtalks, the knots of which hinder it from deſcending. So long as the knots are green they are full of juice; and the upper two, which are the laſt that harden, contain a ſufficient

ent quantity to furniſh the ſubſtance which is to form the flowers and the fruit.

Thus it appears, that the wiſdom of the Creator hath ordained the leaves round the ſtalk, as an architect raiſes a ſcaffold round a building, to be taken away as ſoon as the edifice is finiſhed; for the ſtalk hath no ſooner acquired its full length and neceſſary conſiſtence, than the leaves fade and periſh. Nothing is more admirable, than to ſee with what gentleneſs and force, nature tends and arrives at the accompliſhment of her aim. Several months elapſe before the ear is in condition to make its appearance; but all the neceſſary diſpoſitions being made for the formation of the flowers and grain, in a few days it ſhews itſelf intirely, eſpecially when favoured by mild rains: Otherwiſe, too great a quantity of moiſture, or too much drought, will keep it concealed in its covering; the ſtalk is ſtunted, the fruit is bad, and the grain continuing flat, never acquires the proper degree of ſubſtance.

In a word, all the preparations we have mentioned being finiſhed, the flower appears, which, without contradiction, ſupplies the fruit with its moſt delicate nouriſhment. This flower, in corn, is no other than a very ſmall white tube, that iſſues from the capſula or caſe of the ſeed; the capſula is environed with ſome bundles of other tubes, which at firſt are yellowiſh, afterwards

tend

tend towards a brown colour, and at laſt are blackiſh, a little before they wither and fall off. Theſe ſmall tubes ſerve chiefly to nouriſh, in the capſula of the ſeed, a ſmall down, which is there obſervable. When the corn ceaſes to blow in fair, ſerene, warm weather, a good crop may be expected. If the huſbandman have carefully obſerved the time that in moſt years paſſes between the ſowing and blowing of the grain, they may upon, that obſervation, regulate the ſeed time, ſo that the corn ſhall blow at the ſame age of the moon in which it was ſown. The moſt favourable period is that of the full moon, becauſe then the air is uſually calm, and the weather ſerene. For this reaſon, gardeners prefer above all others, the ſeeds of thoſe flowers that begin and ceaſe to blow at full moon.

Soon as the corn hath done blowing, the extremities of the grain that contain the ſhoot, are formed in the capſula of the ſeed, and come to perfection long before the formation of the farina. This farinous ſubſtance comes afterwards, by little and little, and increaſes, while the juice draws round, of very fine and delicate particles, reſembling down. This down, that ſubſiſts after the flower is gone, ſerves, among other uſes, to keep open the great conduit that paſſes through the large cleft of the grain. Here then we ſee the reaſon of what is advanced above, that an interval of bad weather, does not hinder the ſeed from thriving, provided it does not happen

till ſome weeks after the corn is blown: the ſhoot being once intirely formed, if ſome part of the farina remains, it will be ſufficient to nouriſh it when it is put in the earth. The moiſture of the air is no obſtacle to the formation of the grain; on the contrary, it augments the quantity, though it weakens the quality of the nouriſhing juices; provided, nevertheleſs, that the corn is not laid by long and violent rains. The fruit begins to ripen, after it hath attained its proper ſize. Then the ſtalk and ear whiten, and the greeniſh colour of the grain changes to a yellow or deep brown. Nevertheleſs, they are ſtill ſoft, and the farina contains a good deal of humidity. Whence it happens, that in very wet weather, the ſtraw is eaſily laid and rotted; the ſuperficies of the grain ſwells conſiderably, and yields more bran than flower. On the other hand, a drought dries it too ſuddenly, the grain ſhrivels and becomes of little value. The beſt, therefore, is warm weather, ſeaſonably intermixed with mild ſhowers, that the ſtraw and grain may gradually ripen, and acquire perfection. A farmer who attentively obſerves the temperature of the air, will eaſily foreſee what crop he has to expect; and, in conſequence of that important knowledge, take the moſt proper meaſures in the direction of his affairs.

Finally, when the corn is ripe, it dries and hardens. The point of perfection in the grain,

conſiſts in its quitting the ear with eaſe, without being bruiſed by the flail in threſhing. Different people are of different opinions, about the time moſt proper for harveſt; ſome wait till the corn hath acquired that hardneſs and dryneſs of which we have been ſpeaking; and others begin to reap before that period. Without examining the reaſons by which theſe two opinions may be ſupported, we ſhall only obſerve, that the harveſt and ſeed-time ought to be ſolely decided by the favourable weather.

The Preparation of WATER for ſprinkling the TREES and the PLANTS, in which the ſeeds may be ſteeped before they are ſown or planted, until they ſwell.

He who ſent me the receipt has tried it, and found all the advantage he could expect from the experiment. The plants and greens enlarged prodigiouſly, and acquired an excellent taſte; the ſame happened to the fruit, which likewiſe came in greater quantity, and the grain multiplied very conſiderably. Here then is the manner in which it is made.

TAKE one part of nitre or ſalt-petre (that is, half a pound, one pound, two pounds, or what you will) and two parts, or the double quantity of common ſalt, put them into a crucible, and let

let them be melted together; then take them from the fire and let them cool; and upon one pound of this maſs pour ten pints of water. The ſalts will there diſſolve, and with this liquor you ſhall water your trees and plants, and in it cauſe your ſeeds to be ſteeped.

The facility in preparing this water, is what engages me to make you acquainted with it: you may try it yourſelf, in your own garden, and if you uſe it upon ſome herbs, and afterwards let them run up to ſeed, there is great reaſon to believe that the ſtrength and virtue of that ſeed will be more than common.

The CAUSES, according to M. STROMER, Profeſſor in the Univerſity of UPSAL, which make the TREES freeze in hard Winters, and the Means of preventing ſuch Accidents.

WE muſt acknowledge for principles, that water, when frozen, occupies more ſpace than while it continues in a ſtate of fluidity; that the fat and oil of vegetables, leſs; that all trees, eſpecially thoſe which ſhed their leaves in autumn, drink up a conſiderable quantity of humidity in ſummer, and evaporate in proportion; finally, that the veſſels of ſmall ſuckers, are larger than thoſe of the trunk, and of conſequence contain a greater quantity of moiſture.

Mr. Hales has proved, that a tree in leaf imbibes fifteen, twenty, nay thirty times as much water as that which is drank by one which has no leaves; conſequently the leaves are the cauſe of a tree's drinking ſuch quantities of moiſture.

Dr. Grew has obſerved, that the longer the juice circulates in a tree, the more it changes its aqueous nature into a glutinous fat: and Mr. Hales confirms the fact. This laſt has likewiſe obſerved,

obſerved, that the trees which are green in winter as well as in ſummer, imbibe little water: their juice has a very ſlow motion, and thence becomes glutinous and oily: but it is not fixed in the winter, and its motion, though ſlow, preſerves the leaves upon the tree.

As the trees which ſtill have leaves, are neceſſarily filled with aqueous juices, it follows, that being ſurpriſed by an hard winter, before their juices are diminiſhed or changed into a glutinous nature, that does not ſo eaſily freeze or expand, the veſſels of the tree muſt neceſſarily burſt; conſequently, their juice muſt be extravaſated, and ſo cauſe, as in animals, the death of the tree, by a kind of hæmorrhage which nothing can ſtop. Experience proves the truth of what is here advanced. Thoſe trees which are tranſplanted from a warm into a cold climate, and planted in the right ſeaſon, endure cold winters: on the contrary, they die when planted too early in the autumn, when the juice is ſtill in too great quantity, or too aqueous; or when they are planted too early in the ſpring, after the juice hath begun to riſe in the tree. The hard winter which began at Michaelmas, in the year 1708, was the death of a number of trees which had before ſuſtained, and the ſame kind have ſince ſuſtained, as ſevere a cold, which came later in the ſeaſon. In the northern parts, where the corn very often freezes, people are not ſo much afraid of cold winters, as of thoſe which conti-

nue too long in the ſpring. The wiſe diſpoſition of the Creator ſeems to ordain, that the trees ſhould ſhed their leaves before winter, becauſe they would do them as much harm in that ſeaſon, as good in the others.

Thoſe trees which come from warm and ſouthern countries, contain a greater quantity of aqueous juice than thoſe which grow in the north, as Mr. Hales hath alſo proved by experiment: from whence it follows, that the firſt are in more danger of freezing; and this is daily confirmed by experience. The beſt remedy for preventing the death of thoſe trees, is to imitate nature, that is, to ſtrip off the leaves before they would fall of themſelves, in order to render the juice leſs aqueous and more glutinous; for the aquoſity freezing in the hard winter, would burſt the veſſels of the tree in its expanſion.

The experiments made by M. Stromer, in conſequence of theſe principles, upon ſmall branches of the tops of trees, which are uſually frozen, have ſucceeded extremely well. And Mr. Laurent's relation of what happened in England, in the years 1708 and 1709, is a further proof of the ſame. He ſays, that all ſorts of trees, died in theſe hard froſts, except the mulberries, the leaves of which had been ſtript off before winter, for the nouriſhment of ſilk worms.

In fine, M. Stromer obſerves, that all the leaves ought not to be ſtripped off at once, as they do not naturally fall in one day; but that they ought to be pulled gradually in ſmall quantities, ſo as that in the beginning of winter, the trees ſhould be almoſt quite bare. He likewiſe cautions us againſt tearing off the buds at the ſame time. The right ſeaſon for each tree, ought to be determined by repeated experiments; becauſe thoſe trees which are very aqueous, ought to be ſtripped ſooner than thoſe which have leſs humidity: perhaps too, exoticks, and ſuch as are lately planted, ought to be ſtripped ſooner than thoſe which have been long in the country, or old planted. To theſe laſt obſervations of M. Stromer, we may add, by way of explanation, that the moſt aqueous trees are thoſe which are firſt in leaf in the ſpring; and that nature, always regular in her operations, ſtrips them the firſt in autumn. It is eaſy to obſerve, that the oak and the elm, which are tardy in thruſting out their leaves, preſerve them a long time after the other more tender trees are quite naked.

A Preparation for rendering Wood leſs combuſtible.

Experience ſufficiently proves, that dry wood flames in the fire, and that one kind of wood burns ſooner than another.

The more oily parts there are in wood, the more its pores are open, and the more they are ſhut within, the fire muſt act with more force to diſſolve it. The oil nouriſhes the fire, and the air contained in the pores of the wood, augments the ſeparation and dilatation of the parts, which keep the matter of the wood together, or ſurmounts and deſtroys the attraction by which the particles of the wood cohere.

We know there is in nature, a quantity of ſalts, which do not kindle in the fire, doubtleſs, becauſe they do not contain oil, which ſerves as match in natural bodies. Among theſe ſalts may be reckoned alum, which being heated, riſes up in a kind of a bliſter, occaſioned by the phlegm and air; but this inſtantly ſinks into a dry and calcined matter, which will not conſume in the fire. Wherefore ſuch an incombuſtible ſalt, being inſinuated into the little corners, and concealed pores of the wood, ſo as to drive out all the air, which they formerly contained; the fire can no longer

longer act upon the oily particles of the wood, thus preſerved by the ſalt which lines their receptacles.

Beſides, we know that dry wood receives a quantity of water in its pores, and that ſalt put in water, melts and diſſolves, until the water is perfectly impregnated with it. Hence it is evident, that when dry wood is ſteeped in water thus impregnated, the particles of the ſalt muſt penetrate into the ſmall interſtices, and concealed pores of the wood. Now, if the ſalt in queſtion is naturally incombuſtible, when the water is dried up, the wood muſt reſiſt the fire, on account of the ſaline particles with which it is lined, conſequently become leſs combuſtible.

This fact is confirmed by the following proof. The people that worked in an alum mine, threw into the fire ſeveral pieces of old tubs, and other veſſels which had been much uſed in boiling alum: but theſe fragments of wood, being penetrated with alum, would by no means take fire, although they were left a long time among other combuſtibles. The force of an oven heat, however, conſumed them at laſt; but they never kindled into flame.

From what has been ſaid, it is eaſy to comprehend the cauſe of this incombuſtibility. It is evident, for the ſame reaſon, that if the pores of the wood were occupied by other ſalts of the

ſame

ſame nature with that of alum, the effect of the flame upon it would be leſs, and the diſſolution rendered ſtill more difficult. This perfectly agrees with what has been advanced by a great naturaliſt, who pretends, that if ſeveral incombuſtible ſalts, ſuch as ſea ſalt, vitriol and alum mixed together, be diſſolved in water, any ſort of wood boiled in that water, will acquire from it the virtue of preſerving itſelf againſt the action of fire.

This method would, doubtleſs, be of great advantage, could it be practiſed upon timber for carpenters work; and perhaps it will be one day brought to ſuch perfection. But, in the mean time, it may be advantageouſly uſed, in preparing wood for inlaying cabinets, and wainſcoating apartments; thus preventing ſuch fatal fires as have been more than once occaſioned by a ſimple communication of the fire in the chimney, with the board that was neareſt it. This preparation may likewiſe be uſed upon wooden inſtruments that approach the fire, ſuch as oven-forks, ſhovels, &c. eſpecially in remote places, where it is not eaſy to find others, when thoſe which people have, are ſuddenly damaged or rendered uſeleſs by the fire. In a word, workmen may, by means of this water, make ſeveral curious improvements, as the ſalts will infallibly communicate to the wood, a ſolidity which nature has refuſed.

Of

Of raiſing Asparagus.

Asparagus is acknowledged, of all ſorts of pulſe, to be the moſt wholeſome, at the ſame time that it is one of the moſt delicate. They who cultivate them, unanimouſly agree, that, in order to have them large, they muſt be cut the fourth year only; and that they loſe their reliſh when by a forced heat they are produced before their ſeaſon. Nevertheleſs, a lover of gardening, and of aſparagus in particular, hath communicated to us a memorial, wherein thoſe two points are formally contradicted. His method is to cut the tops in the ſpring of the firſt year; and the reaſon is, that the root, of conſequence, receiving the nouriſhment of the juices, which it muſt have furniſhed to the top, ſpreads, gathers ſtrength, and is in a condition of putting forth much ſtronger tops the following years. He adds, that to deny this fact, is to be ignorant, or pretend to be ignorant of all the principles of vegetation, which inform us, that the deeper and more extenſive the roots are, the finer and more vigorous will the plant be produced from theſe roots. And theſe principles are ſo well eſtabliſhed, that he knows, he ſays, ſeveral farmers who mow their wheat when green, that the roots becoming ſtronger, may

put

put forth a greater number of ſtalks, longer ears, and larger grains.

With regard to the forced aſparagus, he admits, that theſe raiſed in winter, are much inferior to thoſe that come in the ordinary ſeaſon; but he affirms, that by haſtening them a month or ſix weeks only, there is no danger of their loſing their fine reliſh. He obſerves, that aſparagus makes an exception from all the productions of the earth, which receive from the air and ſun, the flavour that conſtitutes their principal merit. What theſe gain by being expoſed to the freſh air, and the heat of the ſun, aſparagus loſes; and for a proof of this aſſertion, he appeals to common experience, by which we find, that the longer aſparagus is left ſtanding, after appearing above ground, the more the reliſh is diminiſhed. It is the earth heated with dung, that gives the flavour: the delicate juices evaporate in the air, and the ſun renders the aſparagus hard and tough. Wherefore, as ſoon as the froſts are over, and a fermentation begins in the ſurface of the earth; aſparagus, which abhors cold, as well as heat, ſprouts ſucceſsfully, poſſeſſed of all the flavour which the ſoil, where it is planted, is able to communicate: it dreads nothing but the prejudices with which people are too eaſily blinded, and which contradicting experience, extinguiſh in the gardiner, the deſire of perfecting his art, and deter him from

from ſubmitting to a labour, from which he is likely to reap but ſmall advantage.

We ſhall not relate here in what manner he heats the ground: it is the ſame method as taught in all books of gardening, for raiſing aſparagus in winter, with this difference, however, that whereas others perform that operation before, he never commences it, till after the froſts. If the reaſons given by this lover of agriculture, are as ſolid as they appear, we hope that thoſe, whoſe experience (the only miſtreſs to be relied upon in this ſubject,) confirms them, will communicate their ſucceſs to the public, that every body may learn how to procure as early as poſſible, and of the beſt kind, a pulſe ſo juſtly coveted in all families; a pulſe which of all kitchen plants, moſt certainly is accompanied with the greateſt advantages, according to the expreſſion of a modern author, a real maſter of the art of uſeful gardening, and the beſt of any who have treated that ſubject. *The ſchool of kitchen gardening*, which he hath lately publiſhed, renders it needleſs to give in our journal, the inſtructive memorials we have in our poſſeſſion, concerning that favourite part of agriculture; and we are reſolved from henceforth, to touch no more that ſubject, unleſs we have remarks or additions to make, better or equal at leaſt, in merit to the excellent definitions and principles of agriculture, which that author hath ſo learnedly and amply explained, in the forementioned work. This is a rule

which

which we propoſe to follow in matters of agriculture, as likewiſe never to republiſh in our journal what hath been already communicated to the public in our language, except in certain caſes, and that in particular which we have now already mentioned, of obſervations, criticiſms, or additions. This method we look upon as the moſt ſimple and moſt likely to ſatisfy the curious, without multiplying memorials, the repetition of which would only obſcure the ſubject, and tire the reader. We may, therefore, boldly preſume, if our eſſays are neither extenſive nor numerous, that they will at leaſt have the merit with conſiderate perſons, of improving their knowledge, and conducting them ſome ſteps in the road of utility.

The

The WHITENING-GROUNDS of HARLEM.

OF all the whitening-grounds of Europe, thoſe that ſend out the cloth the beſt bleached and leaſt worn, are the whitening grounds of Harlem. Harlem or Haarlem, ſo called, becauſe it is founded upon a drier ſoil than moſt of the towns in Holland, is ſituated upon the Spare, which runs through it, and is at a little diſtance from Amſterdam. It was a pretty conſiderable city in the year 1155, a time when Amſterdam was only a ſimple caſtle upon the river Amſtel, from whence it borrows its name. Harlem occupied, at that time, only the ſouthern bank of the Spare: but being burnt down in the year 1347, and one half of it being afterwards deſtroyed by the fire in 1351; the inhabitants, whom neither of theſe accidents diſcouraged, extended their city by re-building it on the other ſide of the river. It was erected into a biſhoprick by Paul V. in 1559. It hath produced many celebrated men, eſpecially in divinity, and boaſts of the honour of giving birth to Laurance Coſter, who perfected the art of printing, which was invented at Mentz, by contriving to make the letters moveable, whereas they were fixed to the wood upon which they were engraved. The woollen manufactory conſtituted formerly the principal occupation of the inha-

inhabitants of Harlem; but ſince that manufactory has gone over to Leyden, they have been chiefly employed in whitening linen, in which they have ſucceeded to admiration. The cauſe of the wonderful whiteneſs in their cloths, is aſcribed to the lye-aſhes of Muſcovy, and to the water of their downs.

Lye-aſhes, properly ſpeaking, are the aſhes of the lees of wine, burnt in the open air in pits. After being dried the volatile ſalt of theſe lees evaporates, and there remains a very fixed ſalt which binds theſe aſhes, renders them compact, hot, diſſolvent, penetrating and corroſive; for which reaſons, they ſcour extremely well. But the name has been extended to aſhes of oak, when, in order to multiply the lye-aſhes, which were dear, they burnt the ſtaves of the caſks where they were depoſited. Theſe new aſhes, pretty much like the firſt, were found to contain a more pungent and more vitriolick ſalt; ſo that, by the diſcovery which happened near Caſſel, a commerce was eſtabliſhed between the principality of Heſſe and Holland, of oak-aſhes, under the denomination of lye-aſhes. The Dutch having afterwards diſcovered that the packs of Muſcovy exceeded all others in quality, gave the preference to the Ruſſian aſhes over thoſe of Germany. By the Ruſſian lye-aſhes, therefore, employed at Harlem, are to be underſtood oak-aſhes brought from that extremity of Europe. They are extremely hard, in conſequence of their being preſſed

ed in loading the ſhips that tranſport them; and before they are uſed, muſt be broken with mallets, and paſſed through a ſieve.

The water of the Downs is nothing elſe than ſea-water, which filtrating through the Downs and mountains of ſand, burſts out perfectly ſweet and clear.

The whitening grounds are ſituated about a league from the city-gates, and the moſt conſiderable of all is in the neighbourhood of the village Bloemendaal. When a piece of linen is to be bleached, it is in the firſt place ſteeped in a lixivium or lye, where other cloth hath been trod: afterwards it is trod in a new lye of lye-aſhes poured upon it boiling hot. This is boiled in large and copper caldrons, and is never poured upon the cloth till it be as clear as wine. The linen is left eight days in this lye, after which it is waſhed and preſſed in the following manner:

They empty ſome buckets full of butter-milk into wooden veſſels fixed in the ground; then they throw in a piece of linen, which three men tread with their feet as much as poſſible. Afterwards they pour in more butter-milk, and then another piece of cloth, proceeding thus alternately till the veſſels are nearly filled, when they lay planks over the linen, upon which they raiſe a large round piece of wood, or great ſtake, touching the lower ſide of a beam, between which

and the ſtake, they drive wedges to preſs the cloth. Six or ſeven days after, they take the cloth out of theſe veſſels; and if it be not white enough, they ſteep it as we have deſcribed above. Afterwards, it is waſhed, and ſpread out to bleach. It muſt be remarked, that after every dipping the cloth is waſhed firſt with black ſoap, then with clear water, and after each of theſe operations, is wrung by means of a machine that turns with a wheel. We ſhall not ſtop to deſcribe this machine, as it is to be ſeen in ſeveral other places.

The whitening-grounds are cut with canals in ſundry places, that there may be no trouble of fetching water from a diſtance. The cloth is watered with long narrow ſhovels, made in the ſhape of a ſcythe. The water of theſe canals comes from the Downs, and it is that which contributes moſt to the luſtre of the Dutch cloth. To prevent the water from becoming thick and muddy, they are extremely careful in cleaning their canals. The waſhing tubs are built in with bricks, with two trap-doors or ſluices, for admitting or excluding the water, according as it is neceſſary.

The greateſt part of the Dutch cloth is made of Sileſia thread, and the linen wrought at Harlem and Almelo is infinitely ſuperior to that of all the other manufactories. But the greateſt part

part of that which is bleached at Harlem, is cloth from Sileſia and Overyſſel, where flax grows in great abundance. All theſe foreign cloths, after being ſoftened, whitened, and having obtained a gloſs at Harlem, are tranſported to different parts of the world, and ſold under the appellation of Dutch cloths, or hollands.

Obſervations upon the Management of Cattle.

WE do not pretend, in this article, to give a detail of the method of managing cattle: we propoſe only to make ſome remarks upon points which we have obſerved too commonly neglected. For this purpoſe, we cannot diſpenſe with cenſuring a general fault of all thoſe whoſe fortunes are under a mediocrity; for people of theſe circumſtances, finding it impracticable to make large profits, reject diſdainfully the ſmall advantages continually in their power; miſtaking the chagrin of envy, and the languor of indolence for marks of the elevation of their ſpirit, and of the nobleneſs of their ſentiments. In vain, the wiſe man informs them, that whoever neglects ſmall profits will decay day by day: in vain reaſon dictates, that from a ſmall ſtock they muſt be contented with ſmall gain; but that a great number of ſmall profits, which it is eaſy to multiply by labour, become in a ſhort time an object of conſideration. Although experience confirms theſe truths daily, by the decay or proſperity of ſome one of their neighbours; they ſhut their eyes to the true cauſes of theſe events, and impute them to thoſe that are ſuggeſted by malice and indolence.

From

From the care of cattle reſult the moſt ſpeedy, the moſt abundant and moſt lawful advantages. There are but too many avaricious monopoliſts in the country, who hoarding up the corn they cannot uſe, with a view to profit by ſome future bad crop, pave the way for a general ſcarcity, which, whenever it afflicts the nation, they endeavour to prolong. But this wickedneſs cannot be practiſed with cattle. Whoever ſhould perſiſt in keeping more of them than he can maintain, would expoſe himſelf to inevitable ruin, by ſtarving his cattle, and he would be very ſoon obliged to get rid of them. There can be no objection againſt him whoſe ſtock is in proportion to his paſture: he contributes towards the public good, by multiplying the ſpecies, by procuring plentiful crops, with the manure he provides for the ground, and by lowering as much as lies in his power, the price of the moſt neceſſary commodities, by the abundance he brings to market.

We muſt not however imagine, that in order to derive a conſiderable advantage from cattle, it ſuffices to have a great number, and to give them the neceſſary fodder: there are many other circumſtances to be attended to, without which it would be in vain to flatter ourſelves with the expectation of riches. In limiting the ſubject to horned cattle, we ſhall obſerve, that they are often kept in too narrow ſtables, from whence many inconveniencies ariſe. Sometimes being

provoked, they fight and wound one another. The moſt voracious ſtarve their neighbours, from whom they carry off all the fodder within their reach; and the injured cows decay inſenſibly, become languid, or give little milk. In the ſummer, the heat incommodes them, a circumſtance which makes them grow lean, and diminiſhes the quantity of their milk. Care, then, muſt be taken, that they have room in their ſtables, that they be cool in ſummer, and warm in winter. At all ſeaſons let them be dry, for that is a material point. Even in ſummer, humidity is diſagreeable to them, and in winter it chills them. To prevent this double inconvenience, it is proper to pave the ſtables with a gentle deſcent, and to dig a ſewer to collect all the water. By this means the cattle will lye always dry, and the dung will run no riſque of growing ſour. Horned cattle contract a habit, ſometimes, of licking one another; and that hurts them to ſuch a degree, that a butcher who perceives it, will give leſs money for them than for others. They are cured of this trick by rubbing the places they have licked with cow-dung, the bitterneſs of which prevents them from re-attempting it.

The deſire of profiting by the milk of the cow, is often the cauſe of the calf's being too early weaned. A month or two more, in fine, the time required by nature, would ſtrengthen it in its youth; it would grow more ſucceſsfully, and in time, fetch a profit with good intereſt. But this

this is ſcarce done any where. No ſooner is it believed that it may ſubſiſt without the mother's milk, than the farmer thinks he gains a great deal by weaning it: ill-fed, and infirm, it grows at beſt to be a ſorry bull, or feeble bullock, from which little profit can be derived, and much leſs ſervice.

The principal ſource of this abuſe ariſes from ignorance, and want of reflection. People either do not know, or do not reflect, that the vital fire incloſed in the heart of a new-born animal, muſt be augmented; that it attracts and is nouriſhed by that contained in the milk; that this vital fire, weak at firſt, would ſcarce have power to ſeparate the auxiliary fire from the milky particles with which it is incorporated, if milk was a leſs delicate ſubſtance than nature hath formed it for this firſt ſervice; but in proportion as the vital fire acquires force, the milk grows thick, becauſe its groſſer particles are deſtined for forming and conſolidating the body of the animal. When the vital fire is arrived at ſuch a degree, as to be ſuperior to the ſuccours which the milk can afford, nature excites the animal to ſeek a more ſolid nouriſhment, and then, but not till then, is the time of weaning it. For, by anticipating that time, they run the riſque of leaving the animal imperfect in its interior parts: the aliment which is adminiſtered, being above its ſtrength, it cannot perform a perfect digeſtion, and the nouriſhment it receives,

is ſo much the leſs, as in all natural bodies, the ſtrongeſt juices, and moſt efficacious qualities, are always comprehended; and as it were, impriſoned in the hardeſt particles. Hence it happens, that a ſickly animal does not derive from the ſame food, ſo much nouriſhment as an animal in health. In effect, the vital heat, too much employed, in reſiſting the attacks of the corrupted humours, hath not force enough to extract from the aliment, the neceſſary auxiliary fire, which is concealed in its boſom. Beſides, the food being but ill diſſolved, paſſes to excrement, producing only a meagre inefficacious dung.

As therefore, we may aſſured, by weaning a calf too early, that it will remain infirm, and of ſmall value; in like manner by leaving it with the mother, as long as its conſtitution requires, we may expect it will become ſtrong and vigorous, and by following this method, we can hardly fail of raiſing a breed of cattle, that will redound both to the honour and profit of the farmer.

Young calves are apt to be attacked by inſects, which diſturb and torment them, while at the ſame time, they prevent their fattening. In order to preſerve them from theſe inſects, and even cure them when they are hurt, it will be proper to prepare an ointment of melted hogs-greaſe and mercury, which muſt be kneaded till they are

are well mixed together. Spread this ointment upon a linen cloth, then wrap it up in three folds, ſtitch it for a collar to the calves, and it will not only cure them, but likewiſe diſperſe the inſects.

There is no better nouriſhment for the young animals, than vetches ſoked in water, till they ſwell; but obſerve to ſteep no more than will ſerve them for once, becauſe when they remain a long time in moiſture, they are apt to grow ſour, and ſo would do them more harm than good.

We ſhall not inſiſt upon the advantages attending the breeding of young cattle, whatever trouble it may coſt; becauſe there is no prudent country-man who is not fully perſuaded of them. To buy what he may have of his own growth, is to a farmer no acquiſition but a diſſipation; becauſe the land produces no money, which is only to be obtained with commodities, and very often the purchaſe of ſome goods deſtroys all the profit reſulting from the ſale of others. It ought, therefore, to be an inviolable maxim, eſpecially with thoſe of narrow circumſtances, to ſpare no pains in improving their ſtock, making ſmall eſtimation of what has coſt them no money, but frugal as if they had bought it. By this means, if we except great accidents, which can never be foreſeen nor prevented, they will find wealth flow upon them annually, though ſlowly, and lay the foundations of a ſolid fortune.

Of

Of the Manner of planting FOREST TREES, by an Officer of the Courts of Juſtice, in Eyre of Foreſts.

THE acorns propoſed to be ſown muſt be gathered before the froſts, and brought into the granary to ſweat. They muſt be laid up pretty early, as I have ſaid, leſt the froſt attack them; and care muſt be taken not to dry them too much. It is uſual to cover them with wet ſand, ſaw-duſt, ſtraw, and ſuch like things: they are likewiſe ſometimes ſuſpended in water. But all theſe methods, howſoever good, are liable to make them ſhoot. Experience hath taught me, that it is better to dig a hole in the ſand two yards deep, to throw the acorns into it, after they are ſweated; and to cover them with ſand a yard and an half high. By this means, the acorns will be preſerved freſh, and will not ſhoot before their time. It muſt be obſerved, that I ſpeak here of a ſandy ſoil only, becauſe in any other, the acorns would not fail to ſhoot and rot. I am of opinion, that the ſpring is the moſt favourable ſeaſon for ſowing them; and that it is better to dig the ground that is to receive them, with a pick-axe or ſpade, than to till it with a plough, even although it ſhould not be dunged.

When

When acorns are firſt laid in a good ſoil, without dung, they grow better afterwards, when they are tranſplanted to a poor ſoil: it is not proper to treat the firſt ſhoot too delicately. By the common way of ſowing them, they generally fall upon their ſide, and ſo lie croſs-ways: I believe it would be better to plant them one after another, and diſperſe them ſo as that the point ſhould be upwards. It is from thence, that both the root and trunk iſſue: the root never fails to bend downwards again into the earth; and the trunk, which is faſtened to it by two ſorts of chains, from which it receives its nouriſhment, mounts ſtraight upwards. As the oak takes very deep root, we muſt expect that the young root will penetrate into the earth, a long time before the trunk have the force to ſprout up.

At the end of two or three years, theſe young trees may be tranſplanted, and they are much more eaſily diſengaged from the ground, without injuring their roots, than when they are five or ſix years old. In the firſt tranſplantation, care muſt be taken to cut their roots. When there is no intention of tranſplanting them a ſecond time, we muſt obſerve, if we would have them thrive quickly, to diſpoſe them at the diſtance of four and twenty feet from one another, and never to aſſociate with them any other trees, which would rob them of the juice of the earth, unleſs

leſs when the deſign is to form a compleat grove, which is an object quite different from that we have in view.

It is a very good maxim, never to tranſplant the beech-tree: it thrives much better in a place where it riſes from the ſeed. But I do not acquieſce in their opinion who ſay, that theſe trees ought to be ſown at ſixteen or twenty feet diſtance from one another; and I reduce that ſpace to one foot; for the beech is like the black wood. It is well known that reſinous trees love to be near one another; and when agitated by the wind, their branches are either broken, or the bark rubbed off; the roſin doth not diſtil by far in ſuch abundance, as when they are cut with an axe or hedging bill. It is the ſame with the beech, the ſalt of which, I affirm, is infinitely more volatile, than that of the oak. If a beech-tree is not pruned, it puſhes out branches on all ſides, it grows in form of a buſh, and a great many years are requiſite to render it a perfect tree. On the other hand, if it is pruned with a cutting inſtrument, the juice evaporates at the wound; it is attacked with a gangrene, and dies. It is, therefore, neceſſary to ſow the beeches thick, that their branches interweaving, may mutually bruiſe and break one another, when they are agitated with the wind. This is done without great evaporation of the volatile ſalt, and without any other danger. The moſt vigorous,

gorous, then, gains the aſcendant, and robbing its neighbours of the nouriſhing juice of the earth, riſes at their expence, and in a few years, becomes a beautiful tree.

With regard to black wood, I think, when it is cut by the ground, it is better to grub up the roots than to burn them; and this laſt cuſtom appears to me of very dangerous conſequence. In effect I have ſeen places which catched fire accidentally, remain bare for ſeveral years, although a prodigious quantity of ſeed was ſcattered upon the ground. It is eaſy to imagine, when the ground is to be prepared by tillage for a new plantation, that it is an indiſpenſable duty to grub up the roots; but otherwiſe no injury is to be feared from them. They will be almoſt all rotten, before the trees raiſed from the ſeed, which may happen at that time to be ſcattered on the ground, ſhall have arrived at a certain height: and what remains then, may be grubbed out, without any danger to the young timber. I ſhall add to what I have now ſaid concerning black wood, that, firs excepted, the ſeed of which ripening in autumn, muſt be put in the ground at the ſame time, I never ſowed nor ever ſaw any ſown in other ſeaſons, but the ſpring.

The birch-tree methinks ought not to be tranſplanted: I have always thought it thrived beſt in the place where it roſe from the ſeed.

The

The alder requires a moiſt ſoil, and muſt be ſown thick. As to the trees that are planted without roots, it is in vain to expect from them any ſubſtantial advantage. They make a ſpacious appearance during the two or three firſt years, after which they wither away. This is a fact, which has been more than once confirmed by experience, and which authorizes me to pronounce, that it is infinitely better to ſow or plant them with their roots.

Of

Of Cabbage, Radishes, Turnips, and other ſuch Plants; methods for preſerving them from the ravages of the game, and the inſects that feed upon them.

PLANTS cultivated in the open field, where there is a great deal of game, are liable to be conſumed, eſpecially by hares; ſo that the huſbandman or gardener is oblig'd to replant his ground three or four times: this is a very great misfortune in thoſe places where a great deal of cabbage is planted; and a great many methods have been uſed to prevent it, tho' without ſucceſs: but this that we are going to preſcribe, may be tried with great ſafety, ſeeing every time it hath been employed, it has alway produced the deſired effect.

The misfortune muſt be prevented at the time of planting. For an acre of ground take two ounces of aſſa fœtida, ſuch as is ſold by the Apothecary or Druggiſt; put it into a ſmall pot full of dung juice, and boil it, until the whole is diſſolved; then empty this decoction into a ſhallow tub, and add a pint or two of dung juice, ſtir it well, with a piece of wood, and carry it into the field for uſe.

All

All the plants, before they are put into the earth, muſt be ſteeped in this compoſition, in the following manner: A perſon muſt be expreſsly employed in preparing them for being planted. Take as many of them as you can, claſp in both hands, and dip them in the prepared matter, ſo as that each plant ſhall be moiſtened in every part. This being done, lay them in heaps upon the ground, and ſprinkle a little earth upon the roots. Diſtribute the plants thus moiſtened, to the planter, who muſt immediately ſet them in the holes prepared for that purpoſe; then preſs the earth againſt the plant with a piece of wood made for that uſe, and continue ſo to the end.

All thoſe who ſhall have occaſion to uſe this remedy, may be aſſured that no game will touch theſe plants; but, on the contrary, avoid them with great abhorrence and precipitation. Yet, the plants which are either not at all or not ſufficiently ſprinkled, will ſoon be diſcovered and eaten by the hares; ſo that the place muſt be replanted. There is no danger of the plant's contracting any bad ſcent from this preparation; for the ſun and air will purify it in time.

As for caterpillars, and other inſects which bite the young cabbage plants, radiſhes, &c. they may be prevented very eaſily, by the following

following remedy——Take a pail of dung-water, and infuſe into it,

Of Aſſafœtida —— 6 dwt.
Woad —— 3 dwt.
Garlick —— 3 dwt.
Laurel berries bruiſed 3 dwt.
Leaves or tops of elder, one handful.
Carline, white Cameleon, or Thiſtle-root, one handful.

Let the whole digeſt for three days and three nights. When you have occaſion to uſe this compoſition, take a whiſp of rye-ſtraw, and dipping it in the pail, ſprinkle the ſmall plants that are infected by thoſe inſects, which will ſoon periſh or forſake the place.

To this remedy we will add another, which is infallible againſt the caterpillars in cabbage—Sow with hemp all the borders of the ground where you mean to plant your cabbage, and you will ſee with ſurprize, that altho' the neighbourhood is infected with caterpillars, the ſpace incloſed by the hemp, will be perfectly free; not one of the vermin will approach it.

RADISHES for SALLAD, uſed by the Rev. Fathers Minimes of PASSI.

THAT which the Botaniſts call horſe-radiſh, and range in the claſs of Turnips or Rapa, is a plant ſo wholeſome and agreeable, that gardeners ſtudy to have them at all ſeaſons; but, notwithſtanding all the pains they take, thoſe only ſucceed which come up in the ſpring and autumn. The Winter-Radiſhes are inſipid, and thoſe of Summer, ſtrong and diſagreeable; equally influenced and injured by the froſt and by the heat of the ſun; they are uſed in perfection only during a ſmall part of the year; and the Fathers Minimes of Paſſi, commonly called the good men, are the only perſons who have found means to have them good at all times; with this difference, however, that their production is much more ſlow in winter than in ſummer.

Theſe fathers, out of their uncommon generoſity, and with a view to the public advantage, have communicated to us, the ſecret of cultivating them, that we may impart it to the public in our journal.———It was from them that the revd. fathers Penitents of Piepus, had the ſame receipt, which they now practiſe with ſucceſs.

Take a quantity of the ordinary horſe-radiſh ſeed, ſteep it in river-water, for the ſpace of four and twenty hours; then put the whole wet as it is, in a little linen bag, well ſecured with packthread: but if you have ſteeped a great quantity of the ſeed, it muſt be divided into ſeveral bags: expoſe the bag or bags to the heat of the ſun, for about four and twenty hours. At the expiration of which, the ſeed will have begun to ſhoot, and you muſt ſow it like any other grain, in land well expoſed to the ſun. Prepare two tubs of ſuch dimenſions, as that the one will exactly cover the other; theſe may be eaſily procured, by ſawing a caſk into two equal parts———Theſe two tubs will ſerve for the winter; for, in ſummer, one will be ſufficient for each kind of earth that is to be ſown. For which reaſon, it muſt be previouſly marked with the tub, that you may not ſow more ſeed than the other tub will cover.

Immediately after the ſeed is ſown, it muſt be covered with a tub, and at the end of three days, you will find your Radiſhes as large as ſmall Civet, of a white colour, having at their extremity two ſmall, round, yellow or reddiſh leaves about the earth, and ready to be cut or plucked for Sallad. Theſe are of a much more delicate taſte than the ordinary Radiſhes, which are always eaten with ſalt.

By taking theſe precautions, you may have them in the moſt ſevere froſts. After having ſteeped the ſeed in lukewarm water, and expoſed it to the ſun (as we have already obſerved) or in a warm place, ſo as that it ſhall ſhoot; warm two tubs, fill one of them with earth well ſmoaked, there ſow your ſeed, and cover it with the other tub. You muſt take care to water it always with lukewarm water, and to carry the two tubs exactly placed over one another, and well joined, into a cellar, or ſome warm place under ground: at the end of fifteen days, you may gather your ſallad.

The reverend Fathers Minimes, were the firſt who found out this method of cultivating horſe-radiſh: and it is to be hoped, that as they are of a quality ſuperor to all others, the utility of them will not be confined to the pleaſures of the table; but, that medicine which employs the ordinary kind of Radiſh, on a great many occaſions, will reap much more conſiderable advantage from this preparation.

QUESTION,

QUESTION, upon the Nature of the inferior EARTH, or the SOIL that is found a good way below the SURFACE.

SIR, I thought I could not do better than addreſs myſelf to you, for the ſolution of a difficulty that retards me in the culture of the ground, which is my only occupation. I beg you will publiſh my letter, that ſome learned naturaliſt may be prompted to give the aſſiſtance of his ſuperior knowledge, to me and ſeveral neighbours, with whom, I have, for a long time, endeavoured to diſcuſs the point, which I ſhall now ſubject to your opinion.

We want to know, if there is any ſort of ſoil that deſerves the name of earth, that is, excluſive of pure gravel, ſandy ſtone, and ſuch matter, which being abſolutely barren in itſelf, may be juſtly termed, bad, dead, brute, ſavage, or receive any other ſuch epithet as the labourer ſhall beſtow.

Although this queſtion, at firſt view, ſeems eaſy to be decided; and one would naturally anſwer, that all ſoil which really deſerves that name, is endowed with ſome degree of fertility; yet the

 people

people of our diſtrict, are reſtrained by the authority of two books upon agriculture, which have made their way hither; namely, the Dictionary of Chomel, and the farm houſe; or, *Maiſon Ruſtique*, of Liger. Theſe two books agree ſo exactly, that one would imagine the authors had copied each other. They forbid the huſbandman, under the moſt terrible penalties, (threatening total barreneſs, perhaps for ſeveral years) from forcing the earth in tilling, and throwing up that forced earth upon the ſurface. The reaſon they give for this prohibition is, that ſuch earth has never ſeen the ſun, nor received the influence of the weather, whence they conclude it is incapable of producing fruit.

We ſhould willingly adhere to the precepts of thoſe whom we have been long uſed to acknowledge as our maſters, if what they ſay in this place, did not ſeem, in ſome meaſure, to contradict what we read elſewhere. In effect, theſe authors ſay, that good ground may be cultivated to the depth of three feet, and that in gardens, it may be turned up from the depth of four feet, becauſe ſeveral kinds of pot-herbs puſh their roots ſo far downwards. On the other hand, ſpeaking of tranſported ſoil, they greatly magnify the modern art of gardening above that of the ancients, who in their writings (ſay they) make no mention of earth being tranſported from one place to another. I believe them upon their word, tho' I have a right to doubt whether the ancients thought it worth while to record a practice

practice which conſiſts only in putting good earth in a place from which bad earth had been taken; in a word, they blame the huſbandman, who dares not repaſs his plough thro' the ſame ridge he hath already tilled.

In my opinion, therefore, it is difficult to reconcile all this with the idea of bad, brute, or ſavage earth, which they forbid us to turn up. For, at what depth do they place it? nothing but the outward cruſt of the earth is ever tilled, and the plough never penetrates a foot and an half. When people carry off the earth from any ſpot, in order to form the bed of a garden, of the depth of four feet, do they take no more than the ſimple ſurface of the ground? In that caſe, they muſt pare a conſiderable ſpace, for a garden of moderate extent; and this, in my opinion, is what no body will be tempted to do. If they dig under this ſurface, are they afraid, in carrying hence this forced, bad and ſavage earth, to make a barren garden, after all the pains they have taken to make it fruitful? Finally, to what purpoſe do they frighten the huſbandman with this brute earth, ſeeing they exhort him to till the ſame ridge twice over, contrary to cuſtom, as well as to his own inclination; for if this is not forcing the earth, I ſhould be glad to know what is. Muſt we want until the huſbandman ſhall paſs a third time over the ſame ridge? Sure, this expedient would never come into his imagination.

Where then is this forced and ſavage earth? By what poſitive marks is it to be known? It is that (they will repeat) which hath never felt the ſun or the weather. Pray has the earth, which you tranſport into your gardens, enjoyed that advantage? What you would have the farmer open in his ſecond tillage of the ſame ridge, hath certainly never been ſhone upon by the ſun, or received the influence of the weather, as it was always covered by that which they had formerly been accuſtomed to till——So that theſe authors forbid, in one place, what they adviſe in another.

If there is no brute and ſavage earth but that which has never ſeen the day, all thoſe kinds which have never ſeen the day, muſt be reputed brute and ſavage: wherefore a bad labourer, an idle and lazy farmer, who has done nothing but ſcratched the ſurface for a certain number of years, muſt have rendered the land worſe than ever; and the ſoil half a foot under the ſurface, which hath been hardened and preſſed down, muſt not be turned up, becauſe it hath loſt ſight of the ſun and air, and conſequently there is nothing more to be expected from it. I do not know in what country ſuch a rule of agriculture will be adopted; nevertheleſs, it follows, from the principles they lay down, and we muſt either give it credit, or doubt the truth of theſe principles.

Not,

Not, but that I am perſuaded, ſuch earth, taken from the depth of a foot or more from the ſurface, wants to be purified by the air, and animated and warmed by the ſun: but, there is a great difference between an abſolute proſcription of ſuch earth, and a prohibition from opening and turning it up, without certain precautions—I readily agree that if, in time of the laſt tillage, immediately before ſeed-time, this earth ſhould be turned up, it would produce a very bad effect, or rather, it would produce nothing at all: but, I imagine it would be very uſeful, if managed in another manner——When, after harveſt, the land is left to lie fallow for one year, would it not be proper, at that time, to till as deep as poſſible, and throw up to the ſurface that earth which ought to be conſidered as new, rather than brute or ſavage? If this operation was performed at the firſt tillage, would not this earth, expoſed a whole year to the air and ſun, be qualified to bear, by the ſubſequent labouring, and to pay with intereſt the ſeed that ſhould be ſown? I ſee nothing to make me think otherwiſe. In the firſt place, it is really earth, it hath received the rains of heaven, which have penetrated the upper ſurface; it hath imbibed, and is impregnated with part of the virtues of the dung, with which that ſurface hath been conſtantly manured: finally, it is replete with all that is proper for vegetation, which is inceſſantly riſing from the center to the

ſuperficies

ſuperficies of the earth.——Therefore, as I have already ſaid, it wants nothing but to be buried, broken and expoſed to the air and ſun, in order to be as good, and perhaps better, than any other ſort of ſoil.

If we ſcrupulouſly adhere to the letter of our books, we ſhould be tempted to believe, that there is no good earth but upon the ſurface, and that the advice given in the *Maiſon Ruſtique*, to dig a trench in the field propoſed to be laboured, in order to be certified of the quality of the ſoil, regards no more than the thickneſs of the firſt cruſt. Nevertheleſs, as bad ſoil is ſometimes found at a little depth, under good earth, ſo is good often met with, under the bad. This is a certain fact, which, in order to illuſtrate, I ſhall recount what I learned of a creditable man, who was in Germany during the laſt war, and had occaſion to converſe with many farmers of that country: theſe farmers are very different from ours, being ſenſible people, and generally good naturaliſts. One of them told him, that having a very barren field, which he knew not how to meliorate, he at length reſolved to dig the earth to a great depth, in expectation of finding good ſoil under the bad: he was not diſappointed in his hope; for having found a thick bed of excellent earth, he took it up, and laid it upon his field, which it improved to his moſt ſanguine wiſh. We cannot ſuppoſe that this earth was ever expoſed to the air and ſun;

ſun; it was brute, it was forced, and yet for all that, made a very good field.

To this I will add another fact, which ſhews how different the beds of earth are, and how intermingled one with another. I take it from the notes which I have formerly made in the courſe of reading. Varenius relates, that the earth at Amſterdam, being dug to the depth of two hundred and thirty two feet, the beds or ſtata were found in the following order.

7 Feet of good garden mold.
9 feet of turf.
9 feet of ſoft clay.
8 feet of ſand.
4 feet of garden mold.
10 feet of clay.
4 feet of earth.
10 feet of ſand.
2 feet of clay.
4 feet of white ſand.
5 feet of dry earth.
1 foot of moraſs.
14 feet of ſand.
3 feet of ſandy mud.
5 feet of ſand mixed with clay.
4 feet of ſand mixed with ſmall ſhells.
102 feet of clay.
31 feet of ſandy gravel.

By

By this account you ſee that the beſt of earth, even garden mold, was found in the depth of three and thirty feet, a kind of earth to which they ſurely would not have given this name, if, forced as it was, they had deemed it brute, bad and ſavage, merely becauſe it had never felt the ſun and air. It would therefore, be of very great importance, not only to me and my friends, but, likewiſe, to an infinite number of others, who are in the ſame ſituation, if ſome connoiſſeur would deſign to tell us in what ſenſe the two authors I have quoted, are to be underſtood, and in what light we ought to conſider the ſoil which is immediately beneath the earth that we labour; for it is plain, that being of the ſame grain with the firſt, if the repoſe which it hath always enjoyed, does not deprive it of the ſame fertility, it is entirely in our option to procure the ineſtimable advantage of renewing our lands, by turning it up, and putting the exhauſted ſoil in it's place. If, on the contrary, we muſt ſtick to the letter of our books, we ſhall be rid of great anxiety, and have no occaſion to preſs our labourers to keep the plough deep in the ground, a practice of which they are ſeldom over fond. In hope of obtaining this ſatisfaction, ſir, I beg you will inſert my letter in your journal, and believe me to be, &c.

At Eſſois near Bar ſur Sanne, April 26, 1751.

A Remedy againſt Rottenness in Sheep.

EVERY body knows what delicate creatures ſheep are, and that among the diſtempers to which they are ſubject, their livers and lungs are uſually attacked when they feed in moiſt places, or upon rotten fodder. As dry paſturage, which alone agrees with them, is not to be found in all places; and in wet years, it is very often difficult to dry the hay before it is laid in, ſo that it heats in the hay-loft, and rots: an inconvenience which in time of continual rains, is incident to all other kinds of forage, it is inconceivable how many ſheep are incommoded, and even periſh. It is ſurpriſing, as this diſtemper is ſo univerſal, that often in a whole diſtrict there is not one ſound ſheep; and the conſequences are ſo fatal, that the breeder is under the neceſſity of renewing his flock continually; this being the caſe, I ſay, it is ſurprizing that none of our books upon farming, have furniſhed us a remedy to prevent ſuch misfortunes. We will now communicate one which, we are aſſured, is very efficacious if employed at firſt in the beginning of ſpring.

Take a pound of wormwood, or abſynthium grafted, the ſame quantity of Spaniſh radiſh, powder and keep them in a box for uſe. It were

to be wiſhed, he had told us what the grafted wormwood is, and how it differs from the great and little abſynthium, which are the only kinds commonly known; perhaps it is procured by ſome particular cultivation.

When there is occaſion to uſe this powder, take two ounces of it, for an hundred ſheep; mix them with four ounces of bruiſed juniper berries, and two or three ſmall meaſures (each containing about two pints) of oat-miſling. The miſling of oats, is a mixture of one third of oats, with two thirds of peas and vetches, which is ſown in March, on ſlight grounds, for forage to the cattle: add to this mixture, a ſmall handful of ſalt, and the half quantity of the whole, of ordinary wormwood powdered.

This compoſition is thrown into the ſheep troughs, every week, eſpecially, in the month of March, about Whitſunday, and in the end of June. Thus, the ſheep will be preſerved from the diſtemper, or at leaſt, it will not make great havock among them.

NETTLE

NETTLE THREAD, invented at LEIPSIC.

ALthough we are told, in ſome books upon plants, that thread may be made of Nettles, as of hemp or flax, the hint is ſo ſimply and ſuperficially conveyed, that every perſon who reads it, will conſider the ſcheme as one of thoſe vain ſpeculations which never can be reduced to practice, with any appearance of advantage. It is not, therefore, without reaſon, that we flatter ourſelves with the hope of intereſting the attention of the public, when we give it to underſtand, that a weaver of ſtuffs, ſilks and velvet, at Leipſic, had made the firſt ſucceſsful experiment upon nettles.

This plant is divided into three kinds, the great, ſtinging, common nettle, *Urtica urens maxima*, the little greek nettle, *Urtica urens minor*, and the roman or male nettle, *Urtica Romana*. It is the firſt of theſe that is uſed for this purpoſe.

The great nettle puſhes out ſtalks to the height of three feet, and ſometimes more, ſquare, channelled, round, covered with a ſtinging hair, branchy, cloathed with leaves, two of which are oppoſed to each other, being oblong, broad, pointed, ind nted in their edges, furniſhed with

ſtinging

ſtinging and burning hairs, attached to pretty long tails. It grows every where in great plenty, eſpecially in uncultivated ſandy places, about hedges and ditches, along walls, and even in gardens.

It is diſtinguiſhed into male and female; and the common people are miſtaken in this plant as well as in hemp and flax, calling the female, male, and the male female. But the Botaniſts who conform themſelves to nature, without confounding the ſpecies of things, call that which bears flowers, the male nettle, and that which bears ſeed, the female. The flowers ſpring at the ſummit of the ſtalk and branches, in the hollow between the ſtem of the leaf and the ſtalk, diſpoſed in branches, each compoſed of ſeveral ſtamina, ſupported by a calix of four green leaves, and leave no ſeed behind them. The ſeed is oval, flat and browniſh, contained in pointed capſulæ. The nettle flouriſhes in June, and the ſeed is ripe in July and Auguſt. Its leaves fade at the approach of winter; but its ſtalk, which reſiſts the rigour of that ſeaſon, puſhes out new leaves in the ſpring. In fine, the colour of the ſtalk and leaves is not always green, but varies, and is called red nettle, yellow nettle, and party-coloured nettle.

The manufacturer whom we have mentioned, having read in Robinſon, that he had made ropes and even ſtuff of nettle, was tempted, if poſſible,

poſſible, to verify the fact; and a great quantity of the ſtalks ſtill green, tho' half withered, being gathered, he dried them over his ſtove, and when the moiſture was entirely exhauſted, bruiſed them ſo as to be able to ſeparate the wood from the bark: by this operation he procured a kind of green hards, which was rubbed and prepared like flax. This new matter being ſpun, he obtained a greeniſh brown thread, very uniform and clear, ſomething reſembling worſted. The manufacturer afterwards boiled this thread, when it yielded a greeniſh juice, and became more white, uniform and ſtrong; ſo that, by continuing the preparation, it is to be hoped an excellent thread may be made, and conſequently a ſtrong and laſting cloth.

We are informed that the experiments are ſtill continued; and that they have all the reaſon in the world to hope, that by obſerving the preciſe time of the nettle's being ripe, by ſteeping and preparing it exactly in the ſame manner, with hemp and flax, they will acquire a perfect knowledge of the nature and properties of the thread which is produced, and which may be employed to advantage, not only by rope-makers, but even by weavers, in making fine ſtuffs.

For the inventer being a man in eaſy circumſtances, not at all jealous of the ſecret, but capable, by his condition, to give weight to his

conjectures,

conjectures, believes that nettle may be wrought like cotton, and produce cloth a great deal more ſtrong, ſoft, warm, white, and of a better pile and more uniform conſiſtence: in this caſe, it would be of great advantage to the public, which would be no longer under the neceſſity of going to buy cotton in foreign countries. But granting that it never can be brought to the perfection of cotton, it might certainly be ſubſtituted in its room, upon many occaſions, and at leaſt produce a very ſtrong and ſerviceable thread; as the ſtalks are long, and the fibres, in like manner, long, clear and firm. This conſideration alone is ſufficient to prompt mankind to renew the experiment, advance the diſcovery, and even bring it to perfection. The eſſay which we have communicated, ought to be conſidered as the firſt moment after the birth of an art which wants nothing but the induſtry of man for its growth and formation. The Pruſſian blue, which now produces a conſiderable traffic, had not ſuch favourable beginnings; for every thing is favourable on the ſide of nettles, which riſe every where, the worſt ground being good enough for their production: with a little cultivation, they might be procured in vaſt abundance; and theſe advantages are certainly worth purchaſing, at the expence of ſome care and trouble.

SEA-

SEA-COAL.

SEA-COAL is a ſubſtance ſcarce known in France, except to blackſmiths, who find it more uſeful than charcoal, on account of its heat and duration: the uſe of it, therefore, might be extended to kitchens and ſtoves, which are now become ſo common and univerſal. But people are diſcouraged from uſing it, by the bad ſcent with which it is attended; and no body among us hath hitherto applied himſelf to contrive means for correcting this fault, becauſe the nature of the coal is not known; and beſides, ſuch application would be founded upon a point of œconomy, which, as it regards private perſons, doth not ſeem worth the pains it would require. Nevertheleſs, it is a certain fact, that if the uſe of ſea-coal were more general than it is, it would ſave a great deal of wood, the price of which daily increaſes, becauſe it diminiſhes in quantity; and would excite us to open coal mines, which are much more frequent in France than is commonly imagined. In conſequence of theſe mines, the people could afford to warm themſelves at an eaſy expence, the lands productive of the coal would turn to account in favour of the proprietors, and the wood might be preſerved for other more neceſſary occaſions. It is with a view to this public benefit, that we print the following eſſay, which we imagine has, moreover,

 the

the merit of novelty to recommend it. M. Zimmerman, who is the author of it, gives at the end, a method for diſpelling the bad ſmell of ſea-coal. Tho' we are perſuaded that he has not found the true method, yet, as he mentions the countries where it is followed, we can do no leſs than adviſe the experiment to be made. We wiſh this eſſay could have been divided, and part of it reſerved for another journal; but the thing ſeems impracticable. It is a ſucceſſion of ideas and arguments, the connexion of which it would be dangerous to interrupt, in a ſubject that requires the whole attention: we hope, therefore, that the length of it will be pardoned; and that, in the ſequel, we ſhall be commended for admitting it, when we ſhall ſpeak of ſea-coal, upon which we have a great deal to ſay, and when our learned men profiting by the lights they may receive from this eſſay, ſhall teach us to burn without danger or diſguſt, this kind of coal in other places as well as in forges.

ESSAY

Eſſay upon SEA-COAL. By Mr. ZIMMERMAN.

SEA-COAL is an hard dry body, found in the earth. It reſembles the common coal in its black colour, is inflammable, and burns for a long time. I cannot extend this definition farther, becauſe we know ſeveral ſorts of ſea-coal, all comprehended under the ſame name, though they are in effect, quite different from one another; and we may in general obſerve, that mineralogy furniſhes us with very little light, touching theſe ignoble minerals. No writer has deſcribed any other ſea-coal than that which he himſelf knew, or taken the trouble of comparing it with the other kinds. They have even, in treating of their nature and origin, given particular truths for univerſal propoſitions: whence hath been formed an unſeaſonable medley of different opinions, which it would now take up too much time to examine. It will be ſufficient to lay, as a foundation for what may be ſaid on this ſubject, the opinion which is generally received among the beſt connoiſſeurs.

The celebrated Mr. Anderſon, burgomaſter of Hamburgh, was of opinion, that ſea-coal derived its origin from petrified wood, ſcattered under ground, and penetrated through and

through, by an inflammable ſubſtance; that the pieces in which the ſtrong ſubſtance predominated, were called ſea-coal; and thoſe in which more of the wood remained, received the name of foſſil-coal. Several learned naturaliſts are of the ſame opinion, or at leaſt, ſuppoſe that the duſt of wood hath engendred the ſea-coal. It cannot be denied, that there are ſome places in which they are not to be found; but as it is plain that the productions are formed by accident, which hath ſcattered wood in theſe places, it is conceived, at the ſame time, that they are the extraordinary work of nature; that they ought to be regarded as a rarity, and not a certain determined ſpecies; and that of conſequence, the ſame cannot be ſaid of all ſea-coal. Thoſe who have become connoiſſeurs from experience, divide ſea-coal into ſeveral kinds, the denominations of which differ, according to the dialects of each country. I ſhall not quote them in this place, becauſe I reſerve them for a particular treatiſe on the ſubject. But the beſt diviſion, that which is moſt conformable to nature, and moſt diſtinct and intelligible, is to diſtinguiſh them into pitch-coal and ſlate coal. The pitch-coal is firm and compact in its texture, of a fine black, or blackiſh brown colour, with a ſhining poliſhed ſurface, like pitch when it is broken. It is heavy, and compared with the others, mild, without ſcoria or other impurities, and contains a good deal of combuſtible matter. It it likewiſe called forge-coal, becauſe it is principally employed in caſting or

or founding works. The ſlate-coal is of leſs value, the texture of it is brittle, and in form of layers. It it is not ſo black nor ſo ſhining as the other; it muſt be laid on ſlight and open, when uſed as fuel, and leaves a great deal of droſs; for which reaſon it is never uſed in forges, being ſolely employed for the uſe of families. It lies above the pitch-coal, and is by the miners called roof-coal.

There is beſides, another kind which deſerves no other name than that of clods of earth, or coal conſumed by time and weather. It is rather grey than black, very light, and does not long retain the fire. Theſe are the principal ſorts of coal, of which the ſlate kind is the moſt common, the pitch-coal the beſt, the coal of petrified wood the rareſt, and the clods of inflammable earth of leaſt value. We might collect forty or fifty different ſorts of theſe coals, according to the different ſpots in which they are found, if we had a mind to enter into a more particular detail.

This examination of external circumſtances, gives little ſatisfaction to a naturaliſt, and indeed, is of no uſe, while we forber conſidering the intrinſic ſubſtance, which cannot always be known from external appearances. In order to arrive at this laſt point, we muſt obſerve, 1. What is the nature of the ſubſtance of ſea-coal; and, 2.

What is the nature of the combuſtible matter, by which this ſubſtance is penetrated.

The ſubſtance of ſea-coal, is, without contradiction, an earth, which in its formation hath been gradually petrified. This earth is not ſubtile and tender, like that which is ſuppoſed to form the baſis of noble metals, and which can be inveſtigated by alchemy alone: it is rather a rude and crude earth, not ſo mild as that of gardens and fields. It muſt have been ſuch as was eaſily waſhed and diſſolved by the water; at the ſame time, it muſt have ſubſided and ſettled ſo as to become compact and conſolidated: it muſt have parted eaſily with the water; it muſt have eaſily imbibed oil, and been petrified, and at length become capable of degenerating into ſcoria or droſs, in a great many of its parts. As a complete proof of what I advance muſt neceſſarily be very long, in order to abridge it, and render myſelf more explicite, I ſuppoſe the ſubſtance of ſea-coal to have been clay. I intreat the reader, to have this propoſition always preſent in his mind, through the whole of what I am going to ſay, and I ſhall follow out the proof to the end.

No body can deny that before, and in the generation of ſea-coal, there was no earth; it is ſtill very diſtinctly perceivable in ſlate-coal. All naturaliſts ſuppoſe, as a thing certain and inconteſtible, that all the ſtones which are in form of ſlates,

ſlates, or beds, were formed of ſuch earth; but I queſtion whether thoſe that advance this propoſition, are able to make out the demonſtration, which would certainly be very long and difficult. The ſlate-coal and pitch-coal, are formed together, and at the ſame time, of the ſame maſs, and differ in nothing but in the greater or leſs degree of maturity. Conſequently, what is granted of the one, cannot be denied of the other. This earth has been diſſolved in water, and in floating diſperſed on all hands; it hath afterwards ſunk to the bottom, as is evident from the beds or layers of ſea-coal, the ſole inſpection of which proves the truth of what I advance. In effect, the ſea-coal is never found in form of veins in the great, long, ſtraight clifts, which deſcend from the ſurface towards the center of the earth; on the contrary, it is found in beds, in an horizontal ſituation. It is taken for granted, that all the horizontal beds of earth, the ſtrata, and conſequently the horizontal veins of the ſea-coal, are formed of an earth, which hath ſunk down and ſettled in the water: this water muſt have afterwards run off, or rather been preſſed out of the ſubſtance of the earth, ſeeing the earth muſt have imbibed an oily ſubſtance, and been petrified; and this could not have been the caſe, had it preſerved its humidity. That this earth is impregnated with oil, and turns of itſelf, into ſcoria, is what we know by daily experience: it were in vain to detain the reader on this ſubject; and theſe two circumſtances

ces prove in their turn, that the earth, which ſerves as a baſis for the formation of ſea-coal, is no other than clay. Let us conſider the experiment of Becher, with regard to iron. He took a quantity of clay, dried it, poured oil upon it, kneaded the whole together, put the maſs in a retort, and diſtilling the humidity, by theſe means obtained real iron. If, in making the experiment, other methods and ſome new ingredients be uſed, we will not obtain iron, but at leaſt a kind of ſcoria partaking of the nature of iron, and in the work be ſenſible of a taſte of ſea-coal. Beſides, the droſs of ſea-coal very much reſembles that of iron. After garden earth, we know no more than two kinds of fat earth, namely potter's earth and clay. Now, thoſe who will not be convinced ſo far by Becher's experiment, as to own the clay, muſt of neceſſity reſt upon the potter's earth; but, in my opinion, its particles are too compact to imbibe the combuſtible ſubſtance, ſeeing they are not even penetrated by water, as the clay is; nor is it at all apt to degenerate into ſcoria. Whence it follows, that it cannot ſerve for Becher's experiment.

The ſecond ſubſtance requiſite in ſea-coal, is a combuſtible matter, which we muſt now endeavour to inveſtigate, and call by its proper name. Abundance of people are apt to affirm, that theſe coals contain ſulphur; but as they prove nothing, their deciſion is neither ſolid nor ſufficient. Others, and they are the moſt numerous,

merous, declare for petroleum or oil of ſtone: but their arguments are as inconcluſive as thoſe of the other ſide. They believe, that becauſe it is extracted from ſeveral ſorts of ſea-coal, this oil muſt every where be the cauſe of their inflammability. Mr. Bergen, in his explanations of the remarkable phœnomena in nature, in his chapter on the inflammation of the air, in a coal-pit, hath endeavoured to prove that petroleum is the combuſtible ſubſtance of theſe coals. He treats this ſubject with great order and method: but, as I perceive an opportunity of proceeding farther than he has done, and one cannot always, in time of need, find mineralogic truths ready diſcovered, we muſt ſeize them when and where they fall in our way. What I ſhall ſay, therefore, will be no more than an explanation of that opinion; and I ſhall in no ſhape contradict Mr. Bergen, if he is not ſo obſtinate in his theory, as to baniſh ſulphur entirely from ſea-coal. I agree with him, and even ſuppoſe, as my firſt theſis, that the combuſtible matter of ſea-coal, is ſomething oily, or fat, or in general, a phlogiſton. It is not found in a common form, but already ſpecified and mixed, ſo as it is every where found in natural bodies. It is therefore, probable and indeed certain, that there is but one phlogiſton in all nature, and of conſequence it is the ſame in all mineral bodies. For this reaſon, in all inflammable bodies, whether reſinous or mineral, as ſulphur, jet, amber, ſea-coal, naptha, petroleum, &c. the inflammable ſubſtance

differs

differs in nothing but in degrees of ſubtilty. Now, as the phlogiſton never appears alone, and is always mixed with an acid, the queſtion is to know, whether it can only unite with one of the ſame acid, or form a mixture with different acids? In this laſt caſe, we muſt not determine the difference of reſinous and inflammable bodies, by the phlogiſton alone, but rather by the acid with which it is mixed: conſequently we can make no concluſion upon the true nature of the terreſtrial roſin, until we have perfectly known the acid with which it is mixed. Hitherto (in my opinion) naturaliſts have not given ſufficient attention to this point; ſo that I ſhall be obliged to ſay ſomething upon the acid of ſea-coal, before I can exactly determine the nature of the terreſtrial roſin.

As to the queſtion, whether the univerſal phlogiſton mixes with more than one ſort of acid? it is decided in the affirmative, by thoſe lights we have received from chemiſtry. Being mixed with the acid of vitrol, it forms a ſulphur as well by nature as by art. With the acid of ſea or kitchen-ſalt, aſſiſted by art, it forms the phoſphorus, and mingles ſo eſſentially in the acid of nitre, that after it is ſeparated, it has no longer its uſual effect. It would be more proper, therefore, to divide the different kinds of the phlogiſton and terreſtrial roſin, according to the acids with which they are mixed: but, unhappily, we cannot unfold or inveſtigate the acid contained

tained in each terreſtrial reſinous matter, that ſcience being hitherto almoſt altogether unknown. Beſides, we do not as yet know all the acids, but only their names, as I ſhall perhaps, one day prove in a particular treatiſe.

Nevertheleſs, in ſpite of theſe obſcurities, we will not fail to uſe our endeavours for diſcovering all that is clear and certain, touching the acid of ſea-coal; with regard to which, the firſt propoſition I eſtabliſh is, that certain kinds of ſea-coal contain an ordinary vitriolic acid. Dr. Bruckman, in his *Epiſtolæ Itinerariæ*, Ep. 84. p. 19. makes mention of green vitriol that was made by Mr. Mayor, apothecary at Oſnabrug, of ſea-coal from the pit or mine of Borghloli; and as this experiment has been repeated, there is no room for believing it was either doubtful or erroneous. He likewiſe mentions, page 20. n. 13. a kind of ſea-coal, in the country of Nordhauſin, from which alum was extracted. I could aſſert the ſame kind is found in our neighbourhood, having myſelf ſeen and examined it; but now it is well known, that ſuch coal is found in other countries. Mr. Kruger, in his diſſertation upon ſea-coal, page 21, obſerves alſo, that ſea-coal being gathered together in heaps, and waſhed or ſprinkled with rain, will kindle of themſelves. Now, this circumſtance is the ſtronger for the ſuppoſition of alum, as ſlate or bed of alum will likewiſe kindle in the ſame circumſtances. Now, the acid of alum is the ſame with

that

that of vitrol; and alum being found in ſea-coal, is a manifeſt proof that the acid of vitrol is there alſo. And how can we account for finding under and in the middle of ſea-coal, the pyrites or true mineral of ſulphur, if we will not admit that it contains the acid of vitriol? This I have been convinced of by ocular inſpection into the coal-pit of Peperwitz; and others may be ſatisfied of the truth of the ſame fact, by reading the learned hiſtory of the pyrites, by Mr. Henckel.

I flatter myſelf with having proved this acid of vitriol, even againſt thoſe who may have doubted it moſt: the demonſtration I have given, is clear and evident; but I don't know if I ſhall be able to give ſuch evidence for that which it remains to prove. This propoſition, which I muſt now endeavour to demonſtrate, is, that ſome kinds, and indeed the greateſt part of ſea-coal, contains the acid of kitchen-ſalt.

Although there is certainly a great deal more ſea-coal of this laſt kind, than of the preceding, it is nevertheleſs, impoſſible to prove is as clearly, or extract from it as evidently, kitchen-ſalt, by means of manual operations, as we are able to extract alum from the other kind. Wherefore, we can diſcover the truth by no other means than probabilities, which are not always ſtrong enough to eſtabliſh a fact. Nevertheleſs, I dare flatter myſelf beforehand, that theſe probabilities will

will be to the liking of naturaliſts; and that they will perhaps, one day, conduct us to a more intimate knowledge of the petroleum, and of amber, according to their chemical principles. As ſea-coal is found in the midſt of petroleum, we may preſume that there is a ſtrict connection between them, that is, a common origin, from the ſame principle. This experiment may be ſeen deſcribed in the collection of Breſlau, for the year 1726, page 472, quoted by Mr. Berger. It is the relation of a ſalt-pit in Hungary; and, if I am not miſtaken, we likewiſe find it in the *Epiſtolæ Itinerariæ* of Dr. Bruickman. A terreſtrial roſin is alſo found in the ſalt-pits of Poland, as Thoilden proves, in his *Halygraphy*, page 164. Not, but that I very well remember the caution that Mr. Henckel often gives in his works, namely, that two things found together in the earth, do not always derive their origin from the ſame principle; and that the one may not be abſolutely the cauſe of the other. But this propoſition ought to be more amply explained, before we have a right to lay it down as a uſeful maxim in natural hiſtory, without fear of error. For we muſt, at the ſame time, conſider the nature all things, the time of their birth, and the ſituation of their parts; and if we examine this propoſition, according to all theſe circumſtances, we ſhall have reaſon to ſay, that it cannot obtain in the preſent caſe. Beſides, my firſt propoſition is ſupported by the nature of hills, that form the roots of high mountains, and of the

ground

ground that riſes into hills, inſenſibly from the plain. In thoſe places where the deſcent is eaſy, we find ſea coal; but we likewiſe find petroleum and ſalt pits, and even the earth of kitchen-ſalt, in limeſtone. The neighbourhood would furniſh us with probabilities ſtill ſtronger, which, however, I cannot here avail myſelf of; and therefore I ſhall only refer the reader to the deſcription of the waters of Lanchſtadt, by M. Henckel, where he will find very juſt arguments well deduced. In my opinion, therefore, as the vitrolic acid triumphs almoſt alone in the principal mountains, it ought to ſhare its dominion with the acid of ſea-ſalt in the inferior hills. After all, there is no contradiction in ſaying, that the phlogiſton may be naturally connected with the acid of kitchen ſalt, and reſide in that form in ſea-coal, ſeeing the thing is proved poſſible, in the compoſition of phoſphorus.

What hath been hitherto ſaid, ſeems evidently to prove, that in ſome kinds of ſea-coal, there is a real yellow ſulphur that forms the inflammable matter; and this what we meet with in thoſe places where the acid of vitriol appears in our mineral. But, in thoſe, where we preſume the acid of kitchin ſalt is connected with the phlogiſton, there is an inflammable ſubſtance formed, which may be compared to petroleum. True it is, we do not yet know what acid reſides in naptha and petroleum; but, when we conſider that naptha, which differs in nothing from petroleum, but in its purity and ſubtility, kindles ſo eaſily, at a

great diſtance from the torch; when we reflect that this effect is occaſioned by very ſubtile exhalations, which at firſt kindle between the oil and torch, and then ſet fire to the oil itſelf; we may conclude that the heavy acid of vitriol is incapable of producing this effect, and that there muſt be an acid in the naphtha, which is altogether unknown. Here we may ſuſpect that among the known acids, is that of kitchin ſalt, which is put in motion by the air alone, and burſts out into pure flame in the phoſphorus. Beſides, (and this is a principal circumſtance) we may from the ſame ſalt, explain the nauſeous and hurtful ſmell of ſea-coal. The acid of kitchin-ſalt mixed with the phlogiſton, yields as bad and dangerous a ſmell as the phoſphorus kinds: and the ſcent of ſea coal, is that which approaches the neareſt to the ſmells of phoſphorus and ſulphur.

I know the celebrated Hoffman pretends to maintain, that the ſmoke of ſea-coal is not at all injurious, and I am of his opinion, when ſpeaking of the ſalt pits of the town of Halle where he lived, becauſe they are attended with peculiar circumſtances; but, I ſhall not ſay ſo much of other places, and other kinds of coals, as for example, that of Wittin. At leaſt, I know by the experience of the coal of Peſterwitz, that in the families where it is uſed, it often occaſions pains and tumours in the head. The exhalation of ſulphur does not produce the ſame effect, other-

wiſe all the officers of the forges would have ſwoln heads; but the frequent exhalations of phoſphorus, are attended with the ſame inconveniences.

I have ſaid enough on the two ſorts of acid in ſea-coal: nor have I contradicted M. Beryer as to the petroleum which he ſuppoſes in the coal; I have, on the contrary, added certain circumſtances which confirm his opinion, whence in time may be diſcovered a truth hitherto very obſcure, touching the eſſential aid of petroleum and other terreſtrial roſins. Yet, I have been obliged to reſtrain the two general propoſitions importing that petroleum is abſolutely found in all ſea-coal; ſeeing, in my opinion, that is too bold an aſſertion.

Sea-coal is a mineral that contains neither copper, ſilver, or other metal, conſequently has not been much inveſtigated or examined.

It is now proper to conſider the works belonging to coal-pits, which have both their difficulties and advantages. The difficulties chiefly conſiſt in this particular, that the coal is found in the lower extremities of hills, and very often in the plain; for which reaſon the mine of coal cannot be ſo well aſſiſted, or the water ſo eaſily carried off, as in mines of metal; for, when the hills are very low, there is a neceſſity for conducting the diſcharge of water a great way, before a proper deſcent

deſcent can be obtained; a circumſtance which is attended with great expence, and always renders the diſcharge difficult. In forcing the water with machines, the expence would be ſtill greater; and the greateſt part of the machines are ſuch as cannot be uſed every where. The machines, reinforced by the preſſure of the air, ſuch, for example, as that ingenious invention of Lieutenant-Colonel Wiedeman, are ſtill more coſtly, and often require reparations, the expence of which, a coal-pit can ill defray. Water, therefore, forms the firſt obſtacle in the enterprize; yet, this obſtacle may be ſurmounted, by employing very ſimple, and conſequently durable machines, according to the ſituation of the place.

The advantages found in working coal, are of different kinds. The firſt is, that ſea-coal lying in horizontal beds, is not ſituated ſo deep in the earth, as metals; wherefore, it is more eaſily diſcovered, and not ſo eaſily loſt: there is no neceſſity for beginning by digging a conduit; it is ſufficient to make the eſſay with an awger, and when you are ſure of having touched the vein, then to begin the conduit.

Another conſiderable advantage is, that the ſea-coal turns to account from the beginning; it is no ſooner taken from the pit than it is converted into money, which pays the workman, and enables us to continue the work.

We ought alſo to number among the great advantages, the permiſſion lately given by the king of Poland, to all proprietors of land, and even to farmers, to dig the earth in ſearch of coal, with the exemption from taxes granted by his majeſty to thoſe who ſhall be ſucceſsful in their reſearches: the moſt efficacious means that can be imagined for engaging people in this kind of work.

It now remains to ſay ſomething of the œconomy in uſing coal. Excluſive of the income that reſults to the proprietor of the coal-pit, thoſe who uſe it in their families, ſave a great deal in the expence of firing, wood being much dearer than coal. Beſides the uſe of it, in forges and families, it may be uſeful on other occaſions.--- Bunting, in his *Sylva Subterranea*, has conſidered almoſt all the different kinds of fire, and ſhews that coal may be uſed every where, as well as wood. I would not abſolutely warrant every thing he ſays of it; but, ſome of his projects are very plauſible; and there is always a great ſaving in ſubſtituting coal in the room of wood, in certain works that require great heat; for example, in baking bricks. Some ſtrangers have tried it here in Saxony, but without ſucceſs: yet the fault muſt not be laid on the ſea-coal; for, if thoſe perſons had reflected that the materials of one country are not to be treated like thoſe of another, they might have eaſily ſucceeded in their enterprize, by the principles of chemiſtry. I believe it is more difficult

to burn limeſtone than brick with ſea-coal, yet this may be accompliſhed by a proper conſtruction of the kilns. Potter's ware may likewiſe be made with ſea-coal, but the fire muſt firſt be made with wood, and then continued with coal: yet we muſt not pretend to make very fine pieces in this manner, or ſuch as will ſerve to prepare victuals: though ſea-coal will ſerve to make ſalt as well as to brew beer. Dyers in black, hatters, and certain other handicraftſmen may uſe it without ſcruple, provided they do not work in delicate colours, and endeavour at the ſame time to correct the coal. Now, if we conſider theſe different trades, we ſhall find that they are the very manufactures, which conſume the greateſt quantity of wood, and that if they employ coal we ſhall be conſiderable gainers, becauſe in that caſe, we can more eaſily employ wood for other purpoſes, in which it is more neceſſary. Indeed I am of opinion that coal may be uſed in a great many other occaſions, provided we could find a method for correcting its bad qualities: for, it certainly yields a moſt violent and diſagreeable odour, which is injurious to mankind, as well as to every thing about the fire. Several curious people have beſtowed much pains in finding a remedy for this inconvenience; it is even reported that the Engliſh have offered an ample reward to any one who ſhall make that important diſcovery: if that be the caſe, I am ſurpriſed they have not imported and introduced that invention of D. Becher, which he has deſcribed in his work, entituled, *Folle Sageſſe*,

or *Silly Sagacity*, N. 13. where he ſays he has purified ſea-coal, and extracted from it more than one kind of oil and tar, as good as that of Sweden. I know an invention of the ſame nature, and the operation ſucceeds perfectly well. The coal is greatly improved, and provided it is not too flinty, may, after purification, be employed in ſmelting metals, and even ſerve the purpoſes of glaſs-works: but it muſt not be taken amiſs, if I refuſe to divulge my ſecret upon ſlight grounds; though I ſhould willingly diſcloſe it, if I were certain it would be put in practice. There is a method deſcribed in the *Haligraphy* of Tholden, ch. 3. P. 2. pag. 89. and in the *Regnum Minerale* of Kranterman, pag. 128. But, as I have not as yet ſeen it practiſed here in Saxony, I conclude it muſt be altogether unknown; and therefore ſhall make it public. Take a quantity of ſea-coal, bruiſe and mix it with potter's clay, ſo as to make a paſte to be formed into pieces like bricks, which being dried in the ſun or by the fire, will ſerve for all purpoſes, even to boil and roaſt victuals. With theſe cakes ſalt is prepared at Unnau in the country of Juliers, at Allendorf in Heſſe, and in Brabant; and beſides, they are employed for all uſes in the country of Liege. The proportion of potter's clay may be different, according as the coals is more or leſs reſinous: Sometimes it will amount to one half or two thirds of the whole maſs; and in ſome caſes one quarter will ſuffice.

Mineralogical

Mineralogical Queſtions, with an Eſſay towards the Solution of them. By Mr. ZIMMERMAN.

EXperience daily teaches us, that metals and minerals, for the moſt part, ſuperabound with ſulphur and arſenic, which are ſeparated from them in the ſmelting furnace, and that the body does not become truly mettalic, 'till after this ſeparation. In reverſing this operation by chemical experiments, we find, that if ſulphur and arſenic be added to a metal, a mixture is produced, which no longer reſembles metal, but rather an ore or mineral maſs. By theſe ſort of experiments metal is brought back to the form of a mineral; therefore the operation is called mineralizing, and this name of mineralization is given to the action of the ſulphur and arſenic upon the metal.

True it is, we cannot always produce a matter that ſhall reſemble natural minerals: for, the chemical production will often retain but a very ſmall appearance of them: from ſulphur and lead the true lead ore is produced: and from ſulphur and flint a real ore, known in our mines by the appellation of *glaſs ore*. Sulphur and regulus of antimony will re-produce antimony; ſulphur and mercury

will make cinnabar, which is the ore of quickſilver; and iron and arſenic will compoſe a mixture of different colours. Of orpiment, filings of iron and ſulphurated copper, I, one day, made a kind of pyrites, though it was not ſo yellow as the common ſort, but rather reſembled pitch. But, from ſulphur and iron, ſulphur and copper, ſulphur and pewter, no true ore is produced. The two firſt mixtures produce nothing but a kind of mineral gravel, and the laſt makes a ſort of pewter ore which is not natural. The celebrated Mr. Henckel has already obſerved that there was no occaſion to employ ſulphur in its ſeparated form for mineralization, as antimony, cinnabar and pyrites may beuſed for the ſame purpoſe. If that great man had puſhed his reſearches ſtill farther, and applied the ſame reaſoning to the arſenic, he might have been perhaps, more happy in counterfeiting the mineral called *Roth Guldens Entz*, which he ſought (I know not for what reaſon) with ſuch eagerneſs.

Thus it hath been concluded from experience and obſervation, that ſulphur and arſenic are the two ſubſtances which reduce metals to the ſtate of ore, and preſerve it in that form; for which reaſon, they are called *Principia mineralificantia*. I ſhall not diſpute the propriety of this concluſion, which is founded upon experiment; though to me it does not appear ſo very evident, that ſulphur deſerves the appellation of principle, and I have

have explained myſelf at large on this ſubject, in my notes upon the mineralogical works of Mr. Henckel. Beſides, I could by no means grant to theſe two principles only, the virtue of mineraliſing, to ſuch a degree as to eſtabliſh this general propoſition. "That ſulphur and arſenic are the only two ſubſtances by which metals are found and maintained in the ſtate of ore." On the contrary, I ſhall upon this inference form my firſt queſtion. *Are there not certain kinds of earth without any appearance of ſulphur and arſenic, which nevertheleſs, are capable of preſerving metals in the form of ore, and of mineraliſing them by chemical operations?* As I propoſe this in form of a queſtion, I ſhall not immediately ſubjoin an anſwer; becauſe queſtions always contain ſomething doubtful, and the anſwer of him who puts the queſtion cannot be very compleat; for which reaſon, I ſhall content myſelf with adding the motives that induced me to form the queſtion. If the true and natural mineraliſation of the mettalic particles does not abſolutely depend upon the force of the acid, but rather is mechanically performed, as in all probability it is; a certain earth may inſinuate itſelf between the mettalic leaves and particles, and keep them ſeparate as well as ſulphur and arſenic. Now, if this earth is neither fluid nor ſhining, the ore will not be looked upon as a mineral, and very little metal will be extracted from it in the eſſay. If, on the contrary, this earth is tinctured by the metal which

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it contains, and appears brown, red, yellow, green or blue, then the colour teſtifies that it is impregnated with metal. From theſe ſorts of earth the eſſay-makers produce gold, ſilver, copper, &c. and it cannot be denied that theſe metals are mineralized in theſe earths, although they contain no ſenſible portion of ſulphur or arſenic: for theſe two matters ſoon manifeſt themſelves where they really are, by the fumes and ſcent which they exhale upon the fire. It will, perhaps be alledged, that theſe earths are formed of ore which has been altered by time, which hath expelled the ſulphur and arſenic by which they were formerly mineralized; but to this allegation I anſwer, that at leaſt ſomething vitriolic ſhould remain from the ſulphur, and that the arſenic ſhould leave a kind of ruſt which is found in other minerals; though no ſuch thing is found in theſe earths: beſides, theſe earths are extremely cloſe and compact, ſo that we cannot preſume they have been altered by time, which generally renders them altogether porous and juicy: and they are moreover properly and naturally ſituated in forms of beds or layers: a circumſtance that is not to be obſerved in earth which has been altered by time and air. To theſe natural indications, let us add the operations of art, which repreſent ſomething of the ſame appearance. A mineralization of metals, reſembling that which we have mentioned, is made between pewter and lead. Pewter reduces lead to a kind of earth or aſhes: zink mineralizes gold, though in a different

rent manner: but I ſhall here confine myſelf to pewter and lead. Pewter being very earthy, partaking very little of the nature of glaſs, and having beſides, very large pores, its phlogiſton eaſily evaporates in the fire: when mixed with lead, it likwiſe deprives that metal of its phlogiſton, which it allows to evaporate. This example will explain what is properly underſtood by the mineralization of metals by means of earths; but, if we would examine this matter to the bottom, let us conſider how the ſaffron of Mars, when mixed in a metal, not by the art of man, but by accident, hinders it from being refined in the fuſion.

As ſulphur abounds with vitriolic acid, and arſenic is a violent corroſive, which likewiſe exerciſes its acid by corroſion, it is plain that theſe two matters mineralize metals in quality of acids. This may be granted without contradicting what has been advanced above: for, when a metal is melted, or very compact and ſolid in its texture, certain it is, all earth cannot penetrate this mechanic texture, and inſinuate itſelf into its pores, which can only admit a ſubtle, fluid, acrimonious earth: now, this ſubtle, fluid, acrimonious earth is no other than an acid; conſequently an acid, as ſuch, mineralizes metals. Whence I ſhall form this ſecond queſtion. *Will not kitchin-ſalt, which likewiſe contains an acid, mineralize metals?*

After

After what has been ſaid, I cannot ſee how this property of kitchin-ſalt, can be diſputed: but, I will proceed farther: It reduces lead and regulus of antimony, to aſhes in the fire; but, as every body will not allow that this change into earth, is a mineralization, I will quote other examples to be ſeen in the ſame manner, in theſe three matters, namely, in a mineral, in a metal mineralized, and in a metal ſtrictly allied with the acid of kitchin-ſalt. This laſt is a *Luna cornua*, or again, a *Saturnus cornuus*, which after theſe metals are diſſolved in *Aquafortis*, have been precipitated by kitchin-ſalt or its acid. With regard to the two firſt of theſe matters, we may chooſe, for example, a mineral, or metal mineralized, and make the trial upon either, we may be certain the experiment will not fail. The effects of the mineralization by nature and art, are theſe. 1. Part of the metal is volatilized in the fire. 2. The minerals will not amalgamate with mercury. 3. They will not be diſſolved by mercury. And, 4. Part of the metal enters the ſcoria. Lead and ſilver which reſemble the *cornua*, produce the ſame effects, the fourth of which is likewiſe produced by ſalt upon copper and iron.

Indeed the poſſibility and imitation of mineralizing metals by the acid of kitchin-ſalt, is manifeſted by the preceding experiments: but it is not enough to know theſe effects; for the principal point is to learn if nature acts in this

this manner, of herſelf; conſequently we muſt change the queſtion, and endeavour to know, *Whether there are not actually in nature, mettalic ores which have been mineralized by the acid of kitchin-ſalt?*

I ſhall firſt ſpeak of iron ore, which in ſome ſhape ought to be divided into two kinds; for, when diſſolved it becomes a reddiſh or yellow earth. I mean its natural rather than artificial ſolution. Every body knows, that when iron ore continues long expoſed to the viciſſitudes of dry and wet weather, it, in time degenerates and diſſolves into a kind of earth and clay. In this condition it is frequently found in the earth, where we ſee it ſometimes degenerated through and through, or at leaſt externally, and changed into a red or yellow earth, which ought to be conſidered as a *crocus martis* naturally formed; and the colour ought to aſcertain the ſaline quality with which it is mixed. Now, we know from chemiſtry, that iron treated with ſulphur or vitriol, yields a red crocus. The colcothar or caput mortuum of vitriol is no other than ſuch an earth of iron, &c. The ſame chemiſtry likewiſe teaches us, that iron diſſolved in the acid of kitchin-ſalt, appears yellow in the ſolution, and that in drying or precipitating it exhibits a yellow earth or clay. Theſe experiments, in my opinion, plainly demonſtrate the cauſes of the red and yellow iron ore; the firſt ſeems allied with the acid of ſulphur, and the yellow with the acid of kitchin-

ſalt;

ſalt; whence it reſults, that kitchin-ſalt preſerves mineralized metals even in their natural ſtate.

It will perhaps be objected, that I have quoted the only example that is to be found in nature: but, provided the truth of this example is granted, and it certainly cannot be denied, it ought to ſerve in the ſame manner, with regard to a great many other minerals; ſince we find abundance that contain ſuch a yellow iron earth in their texture; conſequently, wherever it is found, we may preſume there is an acid of kitchin-ſalt. I ſhall therefore proceed no farther in mineralogy, otherwiſe I might deduce the ſame proofs from the blue, and bluiſh minerals of the copper. Almoſt all the mineral of lead would confirm the proof; for it preciſely reſembles what is called lead ore, and of conſequence can be no other than the mineral of lead corroded by an acid. Nor is it more difficult to determine what that acid is, which thus corrodes the mineral through its whole extent; for the ſmall pieces of pyrites found ſtill in their natural ſtate within the mineral, prove that the acid which formed this natural lead mine, muſt not have been of the ſtrongeſt kind, ſince it could not diſſolve the pyrites. But as all I propoſe in this place, is by way of queſtion, I do not pretend to decide upon any thing.

I ſhall, however, anſwer another objection which may be made even by thoſe people who are

are moſt converſant with mineralogy: they may alledge that the vitriolic acid and arſenic, each ſimply conſidered as an acid, are not capable of effecting a mineralization; but, both being combined with an inflammable earth, they derive principally from thence, the power of producing the form of a mineral; but, they will add, where ſhall we find the acid of common ſalt combined with an inflammable earth, ſo as to produce the ſame effect? To this queſtion I reply, that art combines the acid of kitchin-ſalt with a phlogiſton, when the phoſphorus is made; and this inſtance will ſerve, when they would puſh the propoſition ſtill farther, and confirm it by experiment. "But in the earth (ſay they) no phoſphorus is either made or found." True, but in lieu of it, we find in ſea-coal, the acid of kitchin-ſalt abundantly charged with phlogiſton: a convincing proof, that is alſo naturally found in a condition not at all improper for naturalization.

In fine, ſome perſon may aſk what purpoſe can be ſerved by theſe theoretical queſtions, and ſubtile enquiries? It would be eaſy to aſſign a very good reaſon, if the queſtions I have propoſed were anſwered. But, that no body may think I have thrown them away, without having any view to manifeſt utility, either in theory or practice, I will venture to affirm, that by a preciſe ſolution of theſe queſtions, mineralogy might be reduced to better order, and carried to much greater perfection. Minerals are commonly divided

vided into certain claſſes, according to the metals and demi-metals; but as each claſs includes a good many kinds, there is a neceſſity for inventing a greater number of ſub-diviſions. I think the beſt way would be to divide the mineral of each metal according to its mineralizing ſubſtance, and ſay, for example, the minerals of ſilver are mineralized ſometimes by ſulphur, ſometimes by arſenic, and ſometimes by the acid of kitchin-ſalt, &c.

Thus we ſpeak more conformably to nature, and this order may be obſerved in ranging them afterwards, according to the kind of rock, the limits of the mine, the layers of the earth, &c. Now as hitherto, nothing has been written or ſaid of any matter or mineralizing ſubſtance except ſulphur and arſenic, and as I here give ſome conciſe inſtruction touching a third mineralizing acid, which is kitchin-ſalt, it is eaſy to conclude that mineralogy by this means gains an increaſe of one third; and that in the ſequel, we may diſcover a number of other minerals of this new diviſion, which are not now known to be ſo, or at leaſt, cannot be ranged in any claſs. By this, likewiſe, I give the key to an infinity of minerals, about which diſputes have been hitherto maintained, to know if they are true minerals or only crude productions of mountains: I mean all kinds of volatile minerals, or ſuch as cannot be put in fuſion or ſeparated, and thoſe which appear in veins, as well as others in the mine, but are taken out

out in form of grains, &c. in which it is agreed that there is gold, ſilver, copper, &c. theſe are looked upon as unripe, as well as the pyrites found at a diſtance from gold and ſilver, the minerals of talc, &c. Our books contain a deſcription of theſe minerals, and eſpecially the deſcription of Fichtelberg, where, among other things, page 270. n. 6. certain grains are deſcribed, as if they were of pitch. Mention is likewiſe made, page 273. under the title of *Coſſein*, of blackiſh grains found by the author himſelf; and in page 274. of black ſtones that ſhone like pieces of ice, &c. In regard to this circumſtance, the reader may remember what I have ſaid above, concerning the mixture of common ſalt with the phlogiſton, and of the ſea-coal thence formed; and add to this, after the lights with which we are furniſhed by natural hiſtory, that agat is (if I may be allowed the expreſſion) the nobleſt kind of pit-coal; hence we perceive that the ſame acid may repreſent a mineral either in form of coal, or as a black ſtone that ſhines like ice.

I know very well, that all theſe obſervations will appear at this time of day, as ſo many dreams of the imagination; and therefore I expect they will be received as ſuch by our ordinary miners: thoſe eſpecially who boaſt of the productions of mountains I have mentioned, as of mineral metals, neither ſay nor prove any thing of their natural

ſtate,

ſtate, mineralization, ſeparation, &c. The greateſt part of them, repeat only what they have heard from other people, and utter what they have been told, without having made any reflections or reſearches of their own: thus a good cauſe is often very ill defended. On the other hand, thoſe who decry the ſame minerals, pretend to have made unſucceſsful trials of them, and think they have a right to diſpute on the ſtrength of their experiments, which are for the moſt part unſkilfully made. But if we would not overthrow all hiſtorical certainty, ſince proofs are to be found even at this day, the places from which the minerals have been taken, the minerals themſelves, and the deſcriptions which ſeveral people have given of them, in the courſe of ſo many ages, which agree perfectly well together; I think we ought at leaſt to ſuſpend our judgment in this reſpect. I am willing they ſhould compare paſt times to a dream; provided they will endeavour to ſhew that they themſelves are now thoroughly awake.

I ought likewiſe to ſay ſomething of the practical utility of theſe theoretical reſearches. According as mineralogy is divided, ſo the forges ought to be diſpoſed: we ought carefully to attend to this point, which is of great conſequence for a good theory and ſyſtem in the ſcience. At firſt, people were obliged to divide the forges according to the metals and ſemi-

metals,

metals, and even according to the ſalt-pits; it is of no conſequence, though ſilver, copper and lead be worked in the ſame forge: this they are obliged to do, in thoſe places where theſe metals are found together; but where each metal is alone, it is wrought by itſelf, and then there is a natural proceſs of the font for each. Now, as the minerals of each metal are divided according to their different mineralizing principles, ſo the proceſſes of the font ought to be different according to the mineralizing principle which is mixed in each. There is a particular kind of font for thoſe minerals which contain ſulphur; and this is what is called working rough or plumb.

The arſenical minerals are of this number; but they muſt firſt paſs through the fire, and then they can no longer be properly reckoned among the arſenical minerals. But, a method of fuſion quite different is required for metals which are entirely arſenical without any mixture of ſulphur: and a different method of fuſion muſt likewiſe be obſerved with antimonial minerals. Conſequently a particular method muſt be uſed with minerals that are mineralized by the acid of kitchin-ſalt.

I ſhall not expatiate a great deal upon this new invention; for it is eaſy to conceive with what eye certain officers of forges will regard me, if I undertake to introduce ſuch novelties. That therefore is not my intention. I ſhall content myſelf with having ſhewn by example, how much

theory

theory might influence practice, and to have explained, in a few words, what I have alledged elsewhere; namely, that by improving the science of mines, the revenues of these works might be easily augmented to very great sums. Several persons have been shocked at this proposition, but I have had the good fortune to bring them over to my opinion. In effect, while in working a mine, every thing remains upon the old footing, and people are satisfied with finding from time to time some little new advantage, certain it is, the profit can never become very considerable: but, if we could discover new kinds of minerals, and invent proper methods for melting and separating them, such discoveries would become very important, and furnish fresh matter of conversation in the receivers office. I will not presume to say that I am capable of making such discoveries; but I affirm that it would be no difficult matter to attain to such improvement, by a more careful cultivation of the science of mining, than that which is at present practised. It is with this view I write, and lay the foundations of it, in form of questions and problems: and in full assurance that I can maintain what I have advanced, I leave the solution of them to those who are my superiors in point of knowlege. After all, practice alone must decide the matter. It is she who confirms all arguments, and rectifies all systems; and we know nothing positively until it hath been sanctioned by her. But, we ought to acknowlege

knowlege at the same time, that she must be preceded by reasoning and systems, which are the lights that conduct her researches into the secrets of nature. Without their assistance she gropes along, blindly following a beaten tract; and whatever progress she makes, must be owing to chance, from which she ought to claim no merit. On these principles I publish my new theory on mining, the solidity of which I refer to practice and experiment.

 Account

Account of a new MINERAL.

IT may be reaſonably doubted whether mankind will ever know all the riches of nature. Every century, every age, every country is diſtinguiſhed by new diſcoveries, and the time preſent in this article always adds to the time paſt. The mineral lately found in the neighbourhood of Gera in Voigtland, a province of Saxony, is an inconteſtable proof of this aſſertion. It appears in form of a pretty ſtrong vein leaning againſt a mountain. No perſon hath as yet preſumed to define or impoſe a name upon it, either old or new; becauſe its properties are ſo peculiar, that when ſome people find an analogy between it and certain minerals, others perceive very conſiderable differences between them.

It is a very duſty ſubſtance, extremely white, reſembling chalk, or the whiteſt terreſtrial marrow, a quality without which it would be taken for the talc of ſilver (*lapis talci argenteus*) for, it feels fat to the touch. It is uſed as paint by the ladies, and can neither be altered or impaired by fire: but the talc of ſilver is uſually greeniſh, and that of gold yellow: beſides, talc is flinty, and found in large pieces. All theſe qualities do not center in this new mineral, while it has others which we do not find in talc. A learned and indefatigable

defatigable mineraliſt and chemiſt has endeavoured by all poſſible experiments to diſcover the properties and determine the true uſe of this ſubſtance: and theſe are what he has already aſcertained. 1. The mineral is very proper for poliſhing gold and ſilver: it leaves not one ſcratch, and takes away every thing that can ſtain theſe metals. 2. It ſuffers no change in the fire, and cannot be brought to fuſion. 3. In conſequence of this laſt quality, it may be uſed for the ſmelting and ſeparation of metals. 4. It makes an excellent waſh for the ſkin, which it wonderfully cleans and ſoftens, having nothing corroſive in its compoſition. 5. Being put in water it inſtantly diſſolves. 6. Being diluted with a great quantity of water, it may be uſed as varniſh to figures of plaiſter, which afterwards appear as if they were ſilvered. 7. It may be uſed for drawing on paper like lead ore: the ſtrokes of it are ſoft, ſubſtantial and ſhining, and extremely proper for drawing flowers to be coloured and painted. 8. It yields a very fine magiſterium, infinitely ſuperior to that which is prepared from marcaſite, and affords an incomparable white for the ladies. 9. It may be uſed by organ-makers to ſmear the fuſtian of their moulds, which by that means will be preſerved in the furnace, without being burnt ſo ſoon as it commonly is. 10. It gives a poliſh to the organ-pipes, like that of ſilver. A perſon of learning, to whom we communicated this paper, being juſtly ſtruck with

the qualities of ſuch a mineral which melts in water, and reſiſts fire, thinks he perceives in it ſome reſemblance to a mineral mentioned by Samuel Northon, who calls it Electra. We will here inſert the whole paſſage of that author, in order to enable philoſophers and chemiſts to judge the better of this new ſubſtance, until we can convey to the public, the new experiments which we have the promiſe of uſhering into the world.

Extract from Samuel Northon.

WE ſee in the Spaniſh decades, that a certain mineral has been found in the weſt Indies, called Electra, which we are aſſured is a ſovereign antidote againſt all ſorts of poiſons, and much preferable to gold: but it is doubtful whether it ought to be ranked in the number of ſpirits, bodies or ſtones. We rather think its nature conſiſts of metal, ſtone and mineral together; and by this very mixture, it differs from all three. As it ſeems to be compoſed of mercury, ſulphur and the ſalt of the earth mixed together, there is reaſon to believe it partakes of the nature of each of theſe principles; ſo as to be half ſtone and half metal, and contain the very eſſence of all the things which are produced in the *archæus* of the earth: for it ſurpaſſes minerals in fixation: theſe evaporate, and are deſtroyed by long liquefaction,

faction, but electra remains for ever fixed in the fire.

It excels metals in digeſtion, colour and dignity. 1. In digeſtion, becauſe it exhibits ſigns of a greater and more perfect digeſtion than any other metal. 2. Electra ſurpaſſes ſtones in virtue; for though different ſtones have admirable properties and virtues, ſo as that ſome ſtrengthen the ſight, others are ſerviceable in diſtempers of the ſpleen, a third ſort are cordials, a fourth is ſtyptic, a fifth prevents abortion, a ſixth facilitates the birth, a ſeventh is good againſt the gravel and ſtone, and others are antidotes againſt poiſons. Nevertheleſs there is not one which hath all theſe properties together, or corrects all poiſons, even the moſt dangerous, like electra, and that above all minerals, metals and ſtones, according to its triple nature, which partakes of all three. Whatever others think of the matter, to me it ſeems probable, that it is not ſimple metal, but of a nature ſuperior to that of metal: for, as ſtones, minerals and metals are formed of ſalt, ſulphur and mercury, electra ſeems to have derived its origin from ſtones, metals, minerals and the ſulphur of metals. Theſe three elements, which by means of the *archæus* of the earth, are found re-united by the utmoſt virtue and power of nature, have formed a higher degree of perfection in this, than in any other ſtone, mineral or metal, and nature ſeems to have beſtowed upon it a

crown

crown of virtue and dignity, above all other minerals.

According to the Magi and Spagyrics, there are two electras, the natural and artificial: the natural is that which is produced in the natural *archæus* of the earth; and the artificial is that which the Spagyric maſters make, in imitation of nature.

For which reaſon, Paracelſus examining the nature and uſefulneſs of alchemy, and being deſirous of compoſing an elixir with this electra, as he could not obtain its natural body, he ſhewed in the book of the vexations of the philoſophers, and in the ſixth book of his magical *archidoxes*, a method for compoſing an artificial electra, of which to make an elixir in the manner deſcribed at large in the ſaid books, &c.

Finally, all that is above, regards the male electra: but there is another which is white, and which is often prepared and united with the male, which is red.

The

The Dutch gold-mine, a paper read before the ſtates of Sweden in a general diet held at Stockholm in 1746 and 1747.

NOT above two hundred years ago, the Dutch learned of an Engliſhman, called William Belkinſon, the manner of dreſſing, ſalting and barrelling herrings. He, at the ſame time, taught them how to take and ſalt cod upon the ſea-coaſts: and this art laid the foundation of the wealth and power of that republic. They were ſo induſtrious in opening this gold-mine, and the produce of it in a little time became ſo conſiderable, that in fifty years after they began upon it, namely in 1601, Holland fitted out 900 veſſels and 1500 buſſes for the cod and herring fiſhing. Each of theſe 1500 buſſes employed other three veſſels to ſupply them with ſalt and empty barrels, and to tranſport the fiſh; ſo that the number of veſſels employed in this fiſhery alone amounted to 6900.

Sir Walter Raleigh, after having been at great pains to learn the true ſtrength of the Dutch, acquired by this advantageous trade, aſſured James I. king of England, that they fiſhed upon the coaſts of Great Britain, with at leaſt 300 veſſels

veſſels and fifty thouſand men, excluſive of the veſſels which they fitted out and employed yearly, in exporting their herrings to other countries, which according to him, amounted to at leaſt 9000, containing 150000 men. He added, that twenty buſſes of herrings were ſufficient for the maintenance of 8000 ſouls, comprehending women and children, and that the Dutch, at a moderate computation, had annually 20000 veſſels at ſea for the ſole article of fiſhing, in its different branches.

Mr. d'Aitzema, reſident from the Hans Towns at the Hague, and hiſtoriographer of the United provinces, as well as the celebrated Du Moulin (Commentarius de Lege mercatoria) certify that, in their time, the Dutch drew from the ſea yearly above 300000 tuns of herrings and other ſalt fiſh. This Dutch fiſhery, which may be juſtly termed the great gold-mine of that nation, was at leaſt tripled from the reign of James I. of England, to that of Charles II.

Doctor Benjamin Worſley, who under this laſt, acted as ſecretary of ſtate for the department of trade and plantations, was ſent to Holland about the year 1667, to inform himſelf exactly of the fiſhery which the Dutch carried on in the north ſea; and at his return, made a report to the king, in which he aſſures him, that at the loweſt valuation, the herring fiſhery of the Dutch amounted yearly to three millions ſterling.

The

The reality of this eſtimate he demonſtrated, firſt, by the number of buſſes which then amounted to at leaſt 1600. 2dly, By the quantity of fiſh taken by each buſs. 3dly, By the cuſtom-houſe books of Holland, Zealand and Friezland. 4thly, By the price of fiſh fixed in every place to which they were ſent by the Dutch. He pretends that the value of herrings and cod yearly taken by the Dutch, greatly exceeded the produce of the manufactures either of France or England, and even amounted to a much larger ſum than that which Spain annually draws from America in time of peace. According to this reaſoning, the produce of this fiſhery, together with the woollen and linen manufactures, and the Eaſt India trade, muſt procure to the republic of Holland, a much greater ſurplus in the ballance of trade, than that which is gained in the other ſtates of Europe, and of conſequence, a proportionable ſuperiority of wealth in ready money, and of naval ſtrength in veſſels and men. He obſerved that Holland had at all times regarded its fiſhery in the north ſea, as the baſis of its wealth and power, and in this view, the ſtates had ſucceſſively publiſhed above thirty excellent regulations for encouraging their ſubjects to proſecute this branch with ardour, and put it on a ſtable footing that ſhould be advantageous to thoſe concerned in it.

He demonſtrated, by a fair and juſt calculation, that 10000 l. ſterling employed in the herring fiſhery, maintained more people than 50000 l.

in

in any other branch of commerce; that one buſs bred at leaſt ten ſailors; conſequently 1600 furniſhed 16000 every year. And finally, he obſerved that the moſt famous Dutch admirals, and their braveſt ſea-officers, had been at firſt no other than ſimple fiſhermen. The illuſtrious Mr. De Witt, grand penſionary of Holland, publiſhed in the year 1662, his excellent work of the *fundamental maxims of the republic of Holland*; and that great politician, in calculating the number of the people, which at that time amounted to two millions four hundred thouſand ſouls, and ſpeaking of the means by which they were ſubſiſted, adds that 750,000 lived by the fiſhery alone, in which a great many had acquired immenſe riches. Have we not reaſon then to call this fiſhery a real gold-mine? It is certainly to the Dutch the baſis of a vaſt navigation, and a trade that extends over the whole habitable globe.

The ſouthern parts of Europe, ſuch as Portugal, Spain and France, furniſh the Dutch, in return for their herring and other ſalt-fiſh, with wine, oil, plums, honey, wool, leather, ſalt, lemons, oranges, cheſnuts, &c. and a prodigious quantity of ſilver in coin and ingots. From the Mediterranean the Dutch receive for their herrings, raw ſilk, velvet, ſattin, all ſorts of ſilk-ſtuff, allum, raiſins, oil, &c. and ſpecie. The Baltic takes from the Dutch, herring and cod, as well as the commodities of France and Italy, which

which they do not conſume themſelves, and gives in exchance corn, wax, flax, hemp, pitch, coarſe greaſe, pot-aſhes, copper, plank, timber, &c. The Swedes give ſix quintals of bar-iron for a barrel of herring, one hundred barrels of which, frequently coſt the Dutch no more than one haul. Germany gives to theſe republicans for their herrings and ſalt-fiſh, iron, milſtones, Rheniſh-wine, all ſorts of arms and munition of war, a great quantity of goods manufactured at Frankfort, Nuremberg and Smalkald, and very conſiderable ſums in ready money. The Dutch ſell their herrings in Brabant and Flanders, almoſt intirely for ready money, except a ſmall quantity of tapeſtry and other merchandize which they import from thoſe provinces. In a word, thoſe induſtrious merchants vend their ſalt-fiſh over the whole earth, exchanging it for other goods, or gold and ſilver. Whence it inconteſtably follows, that the fiſhery muſt bring in to the States-General ſeveral millions, in entries and cuſtom-houſe duties; and therefore the Dutch authors themſelves regard the herring fiſhery, as the principal reſource that puts the republic in action. In the war about the ſucceſſion of Spain, the adventurers in the herring fiſhery, gave the States-General, by way of gratuity, a German crown for every ten barrels of herring, for maintaining the men of war which defended the buſſes from the privateers of Dunkirk. On that occaſion the number of theſe barrels was computed yearly at two millions five hundred thouſand: and valuing ten

barrels

barrels of herrings at twenty pounds ſterling, the whole amounted to 5000000 l. Now, five millions ſterling make ſixty millions of Swediſh crowns. In valuing three quintals of iron in bar, at five crowns of this money, it is plain that the Dutch draw yearly from their fiſhery, as much as Sweden could draw from her iron, provided ſhe could manufacture and ſell twelve millions of quintals; hence we ſee that the ſea produces to them annually, more than all the iron mines of Sweden can produce in twelve years, eſpecially if we conſider, that a good part of that metal, the price of which, the Swedes are reſolved to keep up, remains on hand, as may be perceived by the immenſe warehouſes that teem with it every winter. Beſides, if we conſider the conſiderable benefit which by means of this fiſhery, the ſtate reaps by an infinite number of workmen, by taxes laid on the conſumption, without reckoning the prodigious multitude of fiſhers and ſeamen it maintains, we ſhall perceive the importance and immenſe produce of this trade. I ſhall here only mention the net-makers, rope-makers, ſail-makers, packers, appraiſers, coopers, mitten-makers, blackſmiths, carpenters, painters, carters, rowers, brewers, packers, butchers, turners, &c. among whom there is a great number of lame and infirm people, who in contributing to this fiſhery are as good as thoſe who enjoy their health. Add to theſe great advantages, that in Holland the ſervants of both ſexes

ſexes can avail themſelves of their little funds to become adventurers in the fiſhery.

It would be an eaſy matter to demonſtrate, by a larger detail, of what utility this commerce is to Holland; but what has been ſaid is ſufficient to excite the attention of all the maritime nations, and eſpecially of the Swedes, who are ſuch near neighbours to the native place of the herrings. I muſt beg leave to put the following queſtions on this ſubject. 1ſtly, Why has not Sweden done all in its power for more than a century to partake of theſe treaſures, and procure to itſelf a commodity of extreme advantage, which during all that time hath coſt the ſtate ſo many millions? Don't we know that ſix tuns of gold are exported from the kingdom yearly for herring, cod, *dorſch, and clip-fiſh, which come to us from Holland, Scotland and the north, without reckoning ſtock-fiſh and other dried fiſh? Don't we ſee herring-ſhoals upon all our coaſts, as well in the Baltic as in the north, from the gulph of Bothnia, as far as Oeregrund, before the iſle of Oeland, upon all the coaſts of Scandia, and even thoſe of Rugen? But we let them paſs, in order to purchaſe them again from other nations. 2dly, Are not the Swedes in poſſeſſion of countries as near the North-ſea and the Dogger-bank, as the Dutch? Have they not coaſts that are as extenſive and as advantagious for that fiſhery as any other country,

* Dorſch is a kind of ſmall ſtock-fiſh very common in the Baltic.

ſeeing

ſeeing Sweden is bounded by two great ſeas, through which the herrings paſs in their annnal migration *? Don't we know that the Scots and

* The north pole is the native country of fiſh of paſſage, ſuch as herrings, mackarel, plaice, &c. The ice which cover the ſeas that ſurround it, and never thaws, affords in thoſe places, a peaceable retreat which favours the aſtoniſhing fruitfulneſs of thoſe little fiſh. The large ſpecies of fiſh, eſpecially thoſe that are voracious, want a free air for reſpiration, and cannot purſue the ſmaller ſort into their ſanctuaries, where they multiply ſo prodigiouſly that at length for want of ſubſiſtence, they are forced to quit their retreat, in order to ſeek their food elſewhere. The large fiſh do not fail to wait for them at the extremity of the ice, towards the time of their migration: they devour all they can catch, drive them cloſe in to the coaſts, and purſue them in their route, while the birds of prey pour down upon them from all quarters. In conſequence of this perſecution, their march is always in columns, which are commonly as thick as they are broad. With regard to the herrings, which are the ſubject of our preſent obſervations, they quit the ice of the north in the beginning of the year; but the prodigious column which they form, ſoon divides into two wings; the right moves weſtward, ſo as to be near Iceland in the month of March; the left, with which we are more nearly concerned, bends its courſe eaſterly, and comes down the north ſea to a certain latitude, where it divides into two other wings, the eaſternmoſt of which pointing to the northern cape, coaſts along Norway, from whence it ſends off a diviſion by the ſtrait of the Sound into the Baltick, and another towards the country of Holſtein, Bremen, &c. and thence into the Zuderzee. The weſt-

Danes

Danes have formerly caught herrings on our ſand banks? The voyage to the Fief of Bahus, lately publiſhed by Mr. Kalm, informs us even to the ſmalleſt circumſtances of thoſe ancient fiſheries. 3dly, Does not Sweden contain within its limits all the neceſſaries for fiſhing in the North-ſea except, hemp alone? while Holland, on the contrary, can furniſh nothing of its own manufactories for thoſe enterprizes, but cheeſe and butter. 4thly, Cannot we build buſſes and veſſels in Sweden and Finland, cheaper than they are built in Holland? 5thly, Might not we, and ought not we, to recal ſeveral thouſand Swedes who yearly quit their own country for want of ſubſiſtence, to go and live in Holland

ern wing, which is the ſtrongeſt, falls directly upon the iſles of Shetland and the Orkneys, and thither the Dutch go to wait their coming. All that eſcape theſe dextrous fiſhers, continue their rout towards Scotland, and dividing again into two columns, one paſſes to the eaſt of that kingdom, and goes round England, detaching numerous diviſions to the coaſts of Friezland, Holland, Zeland, Flanders and France, while the other moves to the weſtward of Scotland and Ireland. The remains of the whole weſtern wing which have eſcaped the nets of the fiſhers and the voracity of other fiſh and fowl, having at length rallied in the channel, the column is formed anew, and thence iſſues into the ocean from which (without ſhewing itſelf again on the coaſts) it regains, like the firſt weſtern wing, towards winter, the polar ice, under the protection of which it repairs the loſs which the ſpecies has ſuffered ſince they abandoned it.

upon

upon the herring and cod fiſhery; and wou'd it not be better to employ them at home at the ſame work, which would enrich their own country, while they themſelves would find their account in ſuch employment? 6thly, Where is there a country in the world that has the advantage of procuring to itſelf ſuch a conſiderable number of enrolled ſea-men always ready for the ſervice of the crown, and who in time of peace may be employed in a well ordered fiſhery? Such a nurſery of ſeamen, would, without contradiction, be of great advantage both for the navy and trade. 7thly, In effect, what ſignifies Sweden's having all the ſhips of war in the world, if we have not at heart to eſtabliſh ſuch a ſchool of ſeamen? Every body among us knows that we have actually more merchant ſhips than we have occaſion for in carrying on our own trade: and as ſoon as peace is re-eſtabliſhed in the Mediterranean, we ſhall ſee the greateſt part of them laid up and rotting in our ports, unleſs the new eſtabliſhment of a well regulated fiſhery, affords us the means of freighting them with ſalt, hemp, carpenters wood, &c. 8thly, In the preſent ſituation of Sweden, where, without including ſuperfluities, the productions of our country are not ſufficient for our occaſions by ſome millions, can we contrive a more certain method for reducing the courſe of our exchange, than that of drawing treaſures from the ſea, while our mines are not ſufficient to yield us ſubſiſtence? 9thly, Are not we

we a hundred times more blameworthy than our anceſtors, who carried unwrought iron to Lubeck in exchange for beer, garlic, roots and turnips, &c. Whereas we give to the Dutch and Scots, ſix quintals of our iron made into bars, for one barrel of herrings? 10thly, Is it poſſible to find out a more eaſy and certain means to aſſiſt the ballance of our trade than a ſucceſsful fiſhery in the north ſea and the Baltic, and improvement of agriculture? Before we can make our manufactories flouriſh, we muſt labour to make living plentiful and eaſy; for they muſt always languiſh while we are obliged to ſend great ſums of money out of the country, to which it is of very little conſequence, whether the money is exported for neceſſaries, ſuch as bread and ſalt-fiſh, or employed by luxury in the purchaſe of velvets and ſilks, as we ſee every day is the caſe. Certain it is, if our export could be aſſiſted and augmented by a plentiful fiſhery, the courſe of exchange would ſoon fall: if the States of the kingdom took as much care to eſtabliſh a good fiſhery, as they have done to bring our manufactories to perfection, we ſhould ſoon ſee this uſeful branch flouriſh together with our navigation, and the number of wealthy and induſtrious people encreaſe among us every day. In thoſe countries which abound with inhabitants, we commonly ſee a great deal of traffic, and in ſuch countries and none other, the revenues of the State are encreas'd and its treaſures accumulated. 11thly, Would Holland, which neither ſows nor reaps be able by

its trade and manufactures only, to give bread to two millions four hundred thouſand ſouls, as ſome people prepoſterouſly imagine, if it did not draw immenſe treaſures yearly from the ſea? 12thly, What could be of more conſequence to the proſperity of our kingdom than ſuch an eſtabliſhment, eſpecially if at the ſame time a reſolution ſhould be taken to declare Marſtrand a free port.

Obſervations

Obſervations by MARTIN TYDELEKURSON upon the Dutch gold-mine, mentioned in the journal of laſt December.

IT is to be obſerved, that the firſt and greateſt herring fiſhery in the Weſtern-ocean, and North-ſea, was carried on not by the Dutch, but by the Norwegians, chiefly in the Wike of Norway, which while the Fief of Bahus belonged to that kingdom, was called Vuge, and extended from the river of Gotha-Elf to Swine ſund. This fact is proved in the *general deſcription of Norway and the neighbouring iſles*, written in the year 1599, by Peter Claus canon of the cathedral of Stafanger, and publiſhed at Copenhagen in 1632, by the famous Olaus Wormius. That author, after having given a very exact deſcription of the place called Wike, or Fief of Bahus, proceeds in this manner, ſpeaking of the fiſhery of the hay-fiſh, which was formerly on the coaſts.—— "About ſixty years ago (ſays he) that is in 1539, conſiderable fiſheries were carried on under the Wike, or upon the coaſts of the Fief of Bahus, of a fiſh called in this country, *haa*, and by the Germans, *hundfiſh*, which was taken in great quantities by the line, and tranſported in barks to Nylous in Sweden, where it was purchaſed by

the Swedes, who from thence ſold it all over the kingdom. They found this fiſh ſo delicious, that they called it *haa-ſalmon*; they paid a large price for it, and the inhabitants of the coaſt drew conſiderable advantages from this fiſhery; for, the Swedes gave them in return, ſilver, copper, iron, broad-cloth, linen, and other valuable commodities." The ſame author obſerves a little lower, " according to different accounts, very plentiful herring-fiſheries have been carried on in that ſame Wike. The fiſhing was ſo copious in 1657, that ſeveral thouſand barks and veſſels went thither the following years, from Denmark and Holſtein, as well as from the weſtern and northern parts of Norway to fiſh, excluſive of the inhabitants of the Fief itſelf. Beſides, an infinite number of families from the neighbouring provinces, went and ſettled on the ſpot, building houſes in the Wikes, and upon the ſea-ſide, where they fixed their habitations, in order to ſubſiſt by fiſhing. The gentlemen as well as citizens and peaſants, built every where handſome ſhops and houſes, two or three ſtories high, with the ſame deſign. Some of theſe ſhops were ſo ſpacious, that one of them would contain 140 tuns of herrings hanging up to dry at one time. Thus, in a ſmall diſtrict of eight or nine leagues, thouſands of habitations and houſes were raiſed on the ſea-ſide, and an infinite number of people at this day inhabit all theſe coaſts, whether great or ſmall; they are ſettled in all the Wikes in the iſlands and upon the continent, and, in ſhort,

ſhort, in every place where they could partake of this fiſhery. Veſſels arrived in ſwarms every year, from Denmark, Germany, Frieſland, Holland, England, Scotland and France, to purchaſe herrings, of which there was abundance for every buyer, who afterwards tranſported them to more diſtant countries." This herring fiſhery continued 'till the year 1587, when it began to diminiſh. The above cited author attributes the deſtruction of it to the apparition of an extraordinary herring, which was conſidered as a ſign of the divine wrath, which the inhabitants of thoſe places, had incurred by the debauchery and horrid vices in which they had plunged themſelves: but we may as reaſonably aſcribe the diminution and afterwards total ceſſation of this fiſhery, to that art of gutting, dreſſing, ſalting and barreling the herring, which the Dutch in 1548 learned of an Engliſhman, called William Belkinſon. The Norwegians were utterly ignorant of this art, and knew only how to make red herrings, which they dried in their houſes; and in all probability, it was from them that the Engliſh learned that method of preparing their herring, which is now very much practiſed at Yarmouth, from whence conſiderable ſhip-loads of them are yearly exported to the Mediterranean. Indeed it is the chief trade of that town, which by this branch, is become much larger and better peopled than Gottenburg. Charles Guſtavus, one of our greateſt kings, reſolved in good earneſt to ſhare in this golden-mine

of

of the Dutch. In the alliance which in 1656 he made with England, during Cromwel's uſurpation, there was ſtipulated a very advantagious article for the Swedes, touching the liberty of fiſhing on the coaſt of England. Now, as we have had no open war with that kingdom, ſince that time, the alliance ought ſtill to ſubſiſt in full vigour. Theſe are the very words of the tenth article. "The ſubjects of his Swediſh "majeſty ſhall be at free liberty to fiſh upon the "coaſts and ſeas depending upon the republic, for "herrings and other fiſh, provided the number "of their barks ſhall not exceed one thouſand. "During their fiſhing they ſhall not be moleſted "in any mannner, either by the ſhips of war "or privateers belonging to that republic. Nor "ſhall any tax or toll be exacted from thoſe "who ſhall fiſh upon the northern coaſt of "England; but they ſhall have a free liberty "to buy neceſſary proviſions from the inhabit-"ants of thoſe places." Have not we reaſon to aſk what Sweden has been thinking of for almoſt a whole century, that ſhe has not profited by ſuch a conſiderable advantage which that great king procured for the country? The nation, however, now ſeems beginning to get the better of that ſhameful indolence: and indeed, it would be the more unpardonable to continue longer in it, as the king himſelf offers to give all imaginable aſſiſtance to the new adventurers, and the prince royal has declared by an expreſs reſolution, dated October, 3. 1745. "that his royal highneſs will protect

"protect in a particular manner, the fiſhing com-"pany privileged by his majeſty, againſt all the "intrigues which evil-minded and envious per-"ſons may project againſt it, in order to baffle its "laudable deſigns." Nevertheleſs, it is to be feared, that in order to raiſe the ballance of our trade by means of this fiſhery, at leaſt to an equilibrium, we ſhall be embarraſſed to find funds ſufficient to fit out ten buſſes for the fiſhery, and thirty jagers for the tranſportation of ſalt and empty caſks, and the return of the fiſh that ſhall be caught. For this purpoſe, recourſe ought to be had to the public funds; but, unhappily for us, our manufactures are ſtill in their infancy, conſequently in no condition to ſupply this new expence. What reſource then is there in ſuch a caſe? I know of one only, which is, that the ſenators engage to his majeſty to ennoble all thoſe, whether Swedes or ſtrangers, who ſhall make it appear they have embarked 6000 crowns of the current coin of the country, or more in the fiſhing company. Nor will this method of raiſing money, be a new expedient in Europe [a], and

[a] The wiſe republic of Venice, never heſitated in time of need to aſſociate with its nobility, perſons of all ranks and nations, for a ſet ſum of 100000 ducats; nor did this ſtep in any ſhape prejudice the dignity of thoſe families which had more anciently acquired their nobility by their merit; or prevent kings, princes and their chief miniſters, from being ambitious of that honour. Without quoting other examples, it will be

I dare ſay by theſe means, the fiſhery will in a little time become a real gold-mine to Sweden, and one of the ſureſt pillars of the ſtate.

It may be objected that the communication of nobility would be too great a recompence for thoſe who ſhould embark funds in a company from which they themſelves would reap greater advantages than the public. I anſwer, that thoſe who ſhould furniſh ſuch funds, would do an infinite greater ſervice to the ſtate, than that peaſant who in the time of our anceſtors, was ennobled as ſoon as the land which he laboured, enabled him to furniſh a horſeman for the ſervice of the country. Is there any war or other misfortune to be feared, which can become more fatal to Sweden, than the diſadvantage in our exchange, which carries ſo many millions yearly out of the kingdom, and unleſs a ſpeedy remedy be

ſufficient to mention Henry III. of France, who was very deſirous of aſſiſting in perſon at the deliberations of the ſenate of that republic, in quality of a noble Venetian; and Henry IV. did not diſdain the honour of being admitted a member of the ſame body. Thoſe who eſtabliſhed the firſt glaſs-works in France, were ennobled. So true it is, that the art, and privileges obtained for exerciſing it, in no ſhape derogate from the nobility, as may be ſeen more amply explained by M. *Haudiquet de Blancour*, in his work entituled, *The art of making glaſs*, printed at Paris in the year 1697.

applied,

applied, threatens it with ruin and deſtruction [b]. We find on this ſubject, among the very Pagans,

[b] It were to be wiſhed that it was now the cuſtom of Sweden, as it hath been formerly, and ſtill is in other well regulated ſtates, to confer perſonal nobility, that is, upon the perſon himſelf who ſhall deſerve it, and renew among us the dignities of *hærſar*, *jarlar*, *chevalier*, or other ſuch titles, accompanied with ſuch advantage as would encourage good ſubjects, and beſtowed only upon thoſe who ſhould procure ſome real benefit to the public, by their knowlege, application, induſtry, invention, &c. In a word, upon thoſe who ſhould be as uſeful to the ſtate by their arts, as the ordinary nobility are by their arms. The deſire of being diſtinguiſhed among his equals, is a well-placed ambition which God ſeems to have infuſed in the breaſt of man: wherefore, while no pains are taken to flatter this principle, and beſtow that recompence of honour, which is the only practicable one in a poor country, few perſons will be found to ſacrifice their time and ſtudy in rendering themſelves eminently uſeful to the ſtate. The children of thoſe who enjoy an heritable nobility, have no occaſion to give themſelves any trouble to acquire a dignity with which they are born. Thoſe on the contrary ſprung from nobles whoſe nobility is perſonal, would be obliged to take pains to attain by their own merit, the dignities of their fathers or anceſtors. It is very laudable in every nation to excite and encourage warlike geniuſes by honours and rewards; but for all that, thoſe who apply themſelves to the improvement of the country, ought not to be depreſſed, diſhonoured or diſdained: for, they deſerve at leaſt as much encouragement as the others for whom they even procure the means of filling their place with dignity. The warrior

a moſt

a moſt ſtriking example that relates to agriculture. That art, ſo neceſſary to the ſupport of every ſtate, is ſo much eſteemed in China, that the emperor in perſon, with the court, is obliged yearly to labour a certain portion of land, and ſow it with rice; and of the fruits when gathered, he preſents an offering in a coffer of gold to the Creator of heaven and earth. The loweſt peaſant who can invent any improvement upon agriculture, is immediately created a mandarin, as we read in *Du Halde*'s hiſtory of China [c]. Ought not we to follow ſuch laudable examples? and would not he, who could prove he had embarked a ſum for meliorating meadows and fields, or ſucceeded in rendering moraſſes and deſarts capable of culture and fertility, deſerve in like manner among us, to be decorated with a title which ſhould diſtinguiſh him from the indolent and uſeleſs members of the commonwealth? Let us not flatter ourſelves, but be perſuaded that the fiſhery, agriculture, manufactures, and a trade well eſtabliſhed both with foreigners and the interior parts of our

does no more than protect and preſerve what the other has gained: both have their virtues, which maintain the country in a powerful and flouriſhing condition, conſequently both ought to enjoy the ſame protection, the ſame honours and rewards.

[c] The dignity of Mandarin, not only confers the higheſt degree of nobility in China, but this title is at the ſame time attached to the office of captain general, or governour of a province.

own

own country, are the only means that can effectually ſave us and our poſterity from the total ruin with which we are threatened.

[d] If Marſtrand was declared a free port, and a general ſtaple for fiſh there eſtabliſhed, the city of Gottenburg and other ſtaple towns ſituated upon the weſtern ocean, would reap from it very conſiderable advantages. Thoſe of the Fief of Bahus and of Holland, as well as the port of

[d] Marſtrand has the moſt excellent harbour in Europe; it is in the open ſea, and covered on all ſides, even with regard to its double entrance, by an impregnable citadel. This port, which ſaves ſo many thouſand ſhips from being wrecked, and preſerves the lives of an infinite number of people who are toſſed by tempeſts coming from the weſt, and by ſheets of ice coming out of the Categat, can contain the largeſt ſhips of war, and at the ſame time many hundreds of merchant-men; and what renders it ſtill more advantageous, the port is never blocked up by the ice above eight or fifteen days. Can any thing reflect more ſcandal upon the kingdom, than the piteous condition into which this once ſo celebrated ſtaple, is now fallen? It contains no more than twenty families, all of them extremely poor, amounting to ſixty-five perſons, according to the laſt capitation liſt. Above two hundred habitations are uttetly deſerted, and this place, which was formerly ſo powerful, could not ſend a deputy to the laſt diet. In my opinion there is no other way of ſaving this town from total ruin, but by declaring it a free port and general ſtaple, both for our own commodities and thoſe of other nations.

Marſtrand

Marſtrand would be ſufficiently employed by the fiſhery and its dependencies; and they would be in a condition to build veſſels, and procure ſalt, hemp, carpenters wood, and every thing requiſite for maintenance, cloathing, and eaſe of a thouſand times the number of inhabitants which is there at preſent. Theſe ſettlements being made, we ſhould ſee an infinite number of induſtrious inhabitants flock thither from all quarters; for certain it is, people of capacity, are always in ſearch of the places where commerce flouriſhes: on the contrary they avoid thoſe parts where there is nothing to be got. Of this we ſee an example among ourſelves, in the multitude of people who have abandoned the countries I have been mentioning, and gone to ſettle in Holland. Laſtly, thoſe ſettlements muſt be ſecured againſt the intrigues of certain evil-minded perſons, ſome of whom, in order to thwart theſe new undertakings, preſume to utter all manner of falſe reports tending to poſſeſs the public with a falſe notion that the herring and dorſch fiſhery in the ocean and north-ſea, lately granted by the king, would hinder individuals from taking and vending their fiſh upon the coaſt; whereas the new company, far from having obtained an excluſive privilege from the king, never thought of demanding it.—— So long as we are unable to ſtifle in our nation a miſplaced love for every thing that comes from abroad, and an envious hatred to all our countrymen, joined with a fooliſh contempt

contempt for every thing that may be found among ourſelves, we will make but very ſlow advances in our endeavours for the proſperity of the kingdom: but, by deſtroying always with the one hand, what we have raiſed with the other, we run the riſque of being buried at laſt in our own ruins.

Letter concerning the origin, eſtabliſhment and actual ſtate of the bank of Vienna in Auſtria.

YOU aſk me, Sir, what was the beginning of the bank of Vienna, which we have ſeen undergo ſo many revolutions, and as I am able to give you an account of it, you ſhall have that ſatisfaction.

In the year 1703, the imperial chamber was burthened with a great many paſſive debts, on account of the war at that time carried on in Flanders, the flame of which was ready to ſpread into Spain and Italy. The ſums which it owed to different people, and chiefly to the Jews and bankers of the court, called *Oppenheimer*, amounted to forty millions of florins. The chamber finding it impracticable to re-imburſe all theſe ſums at once, the *Oppenheimer* were obliged to fail in the payment of their bills of exchange at the fair of Leipſick, although the payment was prolonged a whole week in their favour. In order to remedy thoſe diſorders, the emperor Leopold, who then reigned, reſolved by the wiſe advice of his miniſters and ſome merchants of Vienna, to eſtabliſh a bank, the notes of which ſhould be payable to the bearer. The prince of Lichtenſtein

ſtein and count d' Abenſperg were nominated directors, and every creditor of the imperial chamber had a note or action, amounting to the ſum which was due to him, to be re-imburſed with intereſt in the courſe of twelve years, by equal yearly payments.

For this purpoſe, his imperial majeſty conſtituted four millions of florins of annual revenue, for the eſtabliſhment of the bank, namely 1500000 on the kingdom of Hungary, two millions on the kingdom of Bohemia and the incorporated countries, and 500000 on the Auſtrian countries; and injunctions were laid upon the treaſurers of theſe countries, to make no payments until the ſums deſtined for the bank, were remitted. Until the bank ſhould begin to receive theſe delegated ſums, his imperial majeſty granted to it, in particular, two millions deducted from the extraordinary aids. At the ſame time the creditors of the imperial chamber were authorized to pay theirs upon the bank: and all the ſubjects of the emperor were forbid to refuſe ſuch payment, eſpecially the notaries were on pain of loſing their office, forbid to proteſt any bank notes that ſhould be offered in payment. The greateſt part of the creditors and the bulk of the traders were at firſt very unwilling to put their confidence in this bank; the delegations occaſioned, in the beginning, almoſt unſurmountable difficulties, and even ſeemed in ſome meaſure to interrupt the courſe of trade; but ſeveral others,

and eſpecially thoſe who had bought the bills of exchange of the *Oppenheimer* at a large diſcount, willingly ſubſcribed to the regulations of the bank, and exerted themſelves with abundance of zeal, in eſtabliſhing its credit, by removing all the obſtacles that might oppoſe it: and by theſe means they acquired the emperor's favour.

Mean while the funds and revenues of the bank did not come in ſo punctually as could have been wiſhed, a circumſtance that induced his imperial majeſty to publiſh, on the 3d of June, 1704, a new patent of the bank to confirm its credit; by this, the bank, inſtead of four millions, was endowed with 5500000 florins per year, in more prompt and punctual branches of the revenue, ſuch as, 1ſt. The *kreutzer* or *ſou* upon the meat of all the hereditary countries. 2dly, Stamped paper. 3dly, A tax called *Appalt* upon the tobacco of all the hereditary countries. 4thly, The cameral revenues of Hungary, under certain reſtrictions. 5thly, A tax upon flour, and ſome others. The re-imburſement of forty millions was fixed anew at the period of twelve years, and they began to pay four of it, on the firſt of December, 1704. The following year, they were to pay 2500000 florins, as much the third year, 3500000 florins in the fourth year 4500000 florins in the fifth, 4000000 in the ſixth, and as much in theſe venth, and 3000000 in each of the laſt five years. The intereſt was to

to be paid in the following manner: at the expiration of the firſt year, 4 per cent. In the ſecond and third, 5 per cent. In the fourth, fifth and ſixth, 6 per cent. In the ſeventh, eigth, and ninth, 7 per cent. And in the three laſt years, 8 per cent. Notwithſtanding theſe regulations, there ſtill ſubſiſted a great number of difficulties which multiplied daily, eſpecially the death of the emperor Leopold, who died ſoon after. It ſeemed extremely hard upon the creditors, to be forced to accept delegations upon the bank for debts of every kind: trade ſuffered accordingly; and credit, which is the ſoul of it, was ſhaken.

The emperor Joſeph, who ſucceeded Leopold, thought he could not fall upon a better expedient for ſecuring the trader, and re-eſtabliſhing the credit of the bank, than that of transferring it upon the city and magiſtracy of Vienna. For this purpoſe, he on the 24th of December 1705, publiſhed a new patent, and aſſigned the funds of the bank upon current and certain revenues. The magiſtracy were obliged to paſs the notes, and conſtitute themſelves guarantees of the creditors; the payments were prolonged to fifteen years, and they paid 5 per cent. intereſt. His imperial majeſty even limited certain articles of the preceding patents, which had ſeemed too hard and perplexing for trade, and granted more favourable conditions to the creditors who were delegated upon the bank. The re-imburſements

were made punctually at the terms, with the intereſt which had been agreed upon: credit began to revive, and the bank ſoon appeared to be upon a good footing, though from time to time ſome difficulties aroſe, which it was abſolutely impoſſible to prevent, and which induced Charles VI. the ſucceſſor of Joſeph, to make new regulations in 1714. His imperial majeſty being fully perſuaded that large intereſt ruined trade and manufactures; and that, on the contrary, nothing favoured them ſo much as punctual payments, as is plainly ſeen in Holland, beſtowed his firſt care in providing new funds for his bank. By virtue of the new regulations, all thoſe who had dead money, were permitted to place it in the bank at 3 per cent. intereſt, and draw upon it for payments, as is the cuſtom in the banks of trading countries. On the other hand, the bank advanced to the merchants on good ſecurity, ſuch ſums as they might have occaſion for in the courſe of trade, at 3 per cent. per annum, and they are at liberty to pay them at any time. The troops, who had formerly loſt a great deal in negotiating the aſſignments of their pay, could now touch it on certain terms, at a diſcount of 3 per cent. for the expences of the bank; the miniſters, civil officers, and other penſioned people, whoſe appointments were often in arrears, were alſo exactly paid at the expiration of the time, by the bank, for the deduction of a certain annual tax called in the patent, *Arrhe de Legitimation*, and divided into ſeveral

ſeveral claſſes. The conſiderable revenues which his imperial majeſty hath granted to this bank, and the great ſums which private people have placed in it, in order to enjoy the benefit of 3 per cent. rather than let their money lie dead, the large penſions which the miniſters and other rich people leave there for the ſame reaſon; in fine, the good regulations and extraordinary privileges granted to this bank, have put, and preſerved it hitherto in a flouriſhing condition, very well adapted for facilitating and animating trade.

A Letter to the author of the Journal, concerning the Diſſertation upon commerce, by the Marquis Belloni.

SIR,

IN your journal for March, 1751, you have inſerted a Diſſertation upon trade, by the Marquis Belloni, which I have read ſeveral times, as an excellent piece; the ſubſtance of all the beſt remarks which have been made by our modern politicians on that ſubject, containing advice to ſovereigns touching the direction of commerce, manufactures and the circulation of money. But ought not he firſt to have conſidered whether it is more neceſſary to direct all thoſe things with ſo much care and concern as he propoſes, or to let them take their own way, under proper protection only? How many general and particular manufactures have been eſtabliſhed and brought to perfection by liberty alone, each having been carried on in its own right! Every individual will be led by honour and advantage, and thence reſults a great whole, which will never be the conſequence of a general direction. If, on the contrary, the government ſhould be too watchful and ſollicitous, and laws too much extended or too minute, ſhould happen to diſturb particular manufactures, in terrifying by penalties often injudiciouſly

judiciouſly inflicted, or recompenſing by prizes ill adjudged, you ſubſtitute intrigue inſtead of emulation. How many things are now carried on with tolerable ſucceſs, meerly from having hitherto eſcaped a pretended legiſlative *Police*, which inſtead of advancing, retards the progreſs of induſtry and improvement. Obſerve how trade flouriſhed in the republics, until its proſperity was interrupted either by time, or other political cauſes foreign to commerce, ſuch as wars, national debt and oppreſſion; the reaſon was, thoſe republics have a ſpirit ever healthy, ever active, which is liberty; and this, far from diminiſhing, actually conſtitutes the public ſtrength; it repreſſes evil and maintains diſtributive juſtice, and the evil being repreſſed, the good appears and predominates: yes, the removal of obſtacles is all that is neceſſary to the ſucceſs of trade. It aſks nothing of the public, but good judges, the diſcouragement of monopoly, an equal protection to all the ſubjects, an invariable value of coin, roads and canals: beſides theſe articles all other cares are vicious; and this vice is the more pernicious to a ſtate, as it flows from an ill conducted zeal: this zeal has partizans, officers in employment and authority, and it requires whole ages to undeceive them of their errors.

Trade is the ſcience of individuals; but the general direction of trade cannot be a ſcience; for it is impoſſible. Oftentimes, when we dive into ſciences beyond our reach, ſuch as the general

neral ſyſtem of the univerſe, infinitude, the union of ſpirit and matter, &c. we are quit for ſo much loſs of time; but in policy, ſuch falſe preſumptions carry us a great way in the fatal paths of ruin and deſtruction. We ought to be perſuaded that, in order to attain to that knowlege which is requiſite for the direction of commerce, it is not enough to know the different intereſts of different nations, provinces and ſocieties; but we muſt alſo underſtand the intereſts and connexions of individuals, together with the quality and value of each commodity. He therefore, who is miſtaken in the leaſt article, will direct amiſs, and enact prepoſterous laws. Who then ſhall pretend to this integral and univerſal capacity? *Non datur ſcientia.* Nevertheleſs the directors of trade arrogate this to themſelves; and if this arrogance be faulty, and they conſult their caprices more than their underſtanding, the reſult will be, laws that cramp the commerce, and favours unjuſtly conferred. Sometimes the council of commerce of a nation or province, ſees the common intereſt only through the eyes of their deputies; theſe ſometimes propoſe private or particular advantages to their own towns or perſons, to the prejudice of other towns and the reſt of the ſubjects; and ſometimes it is to be feared, they lay it down as a maxim to aggrandize what is great, annihilate what is little, and utterly baniſh equality. It is reported of M. Colbert, that when he convened ſeveral deputies of commerce at his houſe, and aſked what he could do for the benefit of trade?

trade? the moſt ſenſible and plaineſt ſpoken man among them, replied in theſe three words. "Let us alone." Have we ever ſufficiently reflected upon the good ſenſe of that ſhort anſwer? This is no other than a kind of commentary upon it. Apply it to every thing that is done for trade, and to what chiefly deſtroys it in monarchies; and examine its effects: you will ſoon find how little fruit and ſucceſs is reaped from all thoſe cares of reſtraint, inſpection and regulation; the republics have made greater advances in trade, almoſt without laws and conſtraint, than other countries when countenanced by the ableſt miniſters; the inſtinct of the bee does more in this particular, than the genius of the greateſt politician: the capital of a republican ſtate, increaſes every day, by œconomy, agriculture, induſtry, brokage, manufacture, and every thing that is underſtood by the idea of trade. There are degrees by which we aſcend ſucceſſively from what is ſimple to what is improved, and from this laſt to the perfection of art; theſe the multitude will climb of themſelves, by communication, example and emulation: they never fail to follow the different ſteps, and never miſtake when left to their own conduct; but when people pretend to ſhew them the road and direct them, woe be to him who miſtakes! The needful is neglected, in order to proceed to what is ſuperfluous before the time. Without mentioning particular nations, how many errors of this kind have been committed

to

to the deſtruction of mankind! How many colonies have been peopled at the expence of the continent! While ſome places enjoyed abundance, how many others have been quite deſerted! How many arts have been admired at the expence of neglecting the gifts of nature elſewhere; fine palaces built, and ſtatues erected, but lands without culture, and villages without inhabitants. Theſe are the effects of the grand ſcience of trade.

The Marquis Belloni thinks it might be of ſervice to trade, to ſet up cuſtom-houſes, and load one kind of commodity with higher duty than another; to exclude foreign merchandize, and favour our own by encouraging the exportation of them. This practice is but too well known in Europe; but the nation who introduced it firſt, hath neceſſarily preſcribed the example to others; each is willing to do the ſame injury to the right of nations which itſelf ſuffers: foreign manufactures were prohibited that one country might not become tributary to its neighbours; ſo that the Europeans, as they increaſed in the knowlege of trade, took meaſures for breaking all communication among themſelves, and in time of profound peace ſuffer all the effects of an univerſal war. No, it is not the good of trade that adviſes theſe meaſures, but ſome private intereſt which too often gets the better of public advantage. If once the multitude is allowed to take their own way, it will ſoon undeceive the world

world in this particular, to the great advantage of ſociety, and ſhow that the paſſage of merchandize from one ſtate to another ought to be as free as that of air and water. All Europe ought to be no other than a general and common fair; the perſon or nation which ſhould make the beſt commodity could find the greateſt advantage. The diſtance and expence of carriage are ſufficient reaſons for any nation to prefer its own goods to thoſe of others; and where theſe obſtacles ceaſe, the ſtranger is preferable to our own countryman, otherwiſe you ruin inſtead of favouring ſubjects in their trade. The cuſtom-houſe duties will always have a bad effect, for the finances of the nation ought to be raiſed from the conſumption only; as all duties levied upon the tranſportation, be what they will, never never fail to diſtreſs the trade. But preſumption and ſelf-love are ſo predominant among men, that they prefer a ſmall advantage acquired by ſophiſtry, ſubtilty or malice, to all that nature and humanity would afford with much more abundance and integrity; though their underſtanding was undoubtedly given them not to domineer but to regulate liberty. Yes, a regulated and enlighted liberty will always do more for the trade of any people, than the moſt intelligent domination: a ſingle man ſees more clearly into the intereſts of his own trade, and conducts it better than ten aſſociates, whoſe intereſts are always divided and often oppoſed to

each other. If he goes too far, if he uſurps over or injures his neighbours, they can ſtop and reſtrain him with the aſſiſtance of juſtice; and this conſtitutes the equality, policy and ballance that are neceſſary to trade: whereas our legiſlators can only perceive ſo many different intereſts in a confuſed manner. Liberty will enrich the merchants, and theſe becoming more or leſs wealthy, according to their talents, will endeavour to bring their manufactories to perfection. The regulations made for manufactories ought to be as ſo many inſtructions to thoſe who are in ſearch of this perfection, in the ſame manner as the books that treat of arts and ſciences. There muſt be all ſorts of degrees of goodneſs in the manufactories, according to the taſte and circumſtances of the purchaſers: imperfection and fraud diſcredit the manufacturer, while diligence and honeſty enrich and bring them into vogue. For theſe reaſons commerce claims liberty inſtead of thoſe penal laws, duties and interdictions by which it is diſcouraged.

Trade itſelf is no other than an abſtract idea lately known, as well as circulation and credit. We ſeem to make new divinities, like the Greeks, in order to adore them: our fathers, who had leſs idolatry and philoſophy, but more wiſdom, were richer by their œconomy and labour, than we by our ſciences of exchange, brokerage, and ſtock-

ſtock-jobbing. Perhaps our poſterity, undeceived by experience, will laugh at the diſeaſe that now prevails in ſeveral nations, of endeavouring to reduce the principles of trade into a ſyſtem: and will place it in that rank which we now aſſign to the Cruſades, and which we ſhall ſoon give to the folly of the political ballance of power in Europe.

Memorial concerning the trade of the republic of GENOA.

THE memorial which we propoſe to give, concerning the trade of Genoa, lays us under the neceſſity of reproaching the modern hiſtorians with having neglected the precept of Horace, in writing for the many. With this view, and in order to ſecure the ſucceſs of their books, they collect all that is remarkable in the hiſtory of the people, and combining theſe facts by an eaſy chain, preſent them to the reader under the name of revolutions, being a tiſſue of ſtriking events, calculated to dazle the underſtanding. But when any reader, more attentive than the reſt, and eager after inſtruction, convinced of this truth, that all bodies are exhauſted, and their deſtruction accelerated by violent motion: when ſuch a reader, I ſay, endeavours to find what were the reſources that maintained an eſtate agitated and tore to pieces by domeſtic diſſentions, how it acquired and ſupported theſe reſources, by what events the old funds were drained, and by what ſagacity the new were furniſhed; then the torch which hitherto lighted them, is ſuddenly extinguiſhed, the day is changed into darkneſs, and the hiſtorian vaniſhes from his ſight: in the ſame manner as a man who being concealed behind a curtain, puts ſeveral figures in motion

motion by ſecret ſprings, then carries off the machine, and privately withdraws himſelf from the ſpectators, congratulating himſelf with having amuſed them ſo long.

What we ſay of nations in general, becomes a matter of much greater conſideration, when applied to a trading republic. As a commonwealth is ſeldom formed but in barren countries, where the produce of the earth is not ſufficient to maintain the inhabitants; trade, to which they addict themſelves through neceſſity, becomes peculiar funds of the ſtate, the baſis of its grandeur, and the principal ſources of its ſtrength: of conſequence it had been the chief object in thoſe republics, regulated all their intereſts, and proved the ſecret motive of all their enterprizes. Its progreſs or decay hath determined their ſtrength or weakneſs, and according as it hath been in a ſtate of quiet or interruption, they have found themſelves in the ſame ſituation with the prince whoſec ountry is defended from inſult, or ravaged by the troops of an enemy.

It is therefore indiſpenſibly neceſſary, in writing the hiſtory of a trading republic, to follow its commerce from ſtep to ſtep, and repreſent the actual ſtate of it from time to time. It is by this knowlege only that the reader can rightly judge of the wiſdom of thoſe who governed it, either in the calm which it enjoyed, or in the troubles by which it was toſſed: by this alone he diſcovers

thoſe

thoſe powerful reſources which all of a ſudden raiſe up thoſe ſort of republics, at times when they are thought to be at their laſt gaſp. Nevertheleſs, this point is of all others the moſt neglected by our hiſtorians: they look upon that trade which is carried on by private people, as a particular affair unworthy of being inſerted in their hiſtories; or if, by the nature of the circumſtance they are obliged to mention it on account of a rupture with ſome power, they do it haſtily in a few words, and hurry over to the recital of warlike events, by which alone their attention is attracted. The reader's fancy being drawn on by the narrative, to the end of the career, he is ſurpriſed to find his memory charged with a multitude of facts and events, the cauſes of which he does not know; and having ſeen the luſtre of a ſtate ſeveral times ſucceſſively eclipſed and re-inlightened, without being able to diſcover the concealed principle of theſe viciſſitudes, he believes he has been all the while travelling on fairy ground.

We ſhould have been deprived of the ſolid reflections which for a century were made on the Roman hiſtory, had this method been followed by the hiſtorians of that commonwealth. In this particular there is no difference between a warlike and a trading republic: on the contrary, both ought to be conſidered in the ſame point of view. For every country in which a trading republic eſtabliſhes her commerce, is to her in the nature

nature of a ſtate newly conquered, which ſhe reduces into a province or compels to pay tribute, and from which ſhe draws as real ſtrength as that which a warring republic draws from the nations it hath conquered. An incontreſtable proof of this aſſertion is the jealouſy and diſquiet that appears when another power extends its trade, and penetrates into the places where ſhe had eſtabliſhed her commerce: diſquiets as violent and attended with the ſame effects as thoſe of a military ſtate, who ſees one of its neighbours receive a conſiderable increaſe of dominion. This parity therefore proves, that their hiſtories ought to be written in the ſame order, and upon the ſame principles.

Not that we pretend, in making theſe obſervations, to finiſh intirely, in this memorial, the career we have preſumed to open. This, the nature and limits of a journal will not permit: but we flatter ourſelves with having opened a path hitherto untrod, and hope that the plan which we have ſketched, when followed and corrected by an abler pen, will one day produce real hiſtories of trading ſtates.

Touching the more remote antiquity of Genoa, there is nothing to guide us but fable. The firſt time the Roman hiſtory mentions this city, is to tell us that in the courſe of the ſecond punic war, it was deſtroyed by Mago the Carthaginian general. It therefore ſubſiſted, and was conſiderable even

at that time. If we may be allowed to hazard our conjectures, we will aſcribe its origin to ſome colony from Greece, of which the memory is quite loſt. We know that Marſeilles upon the ſame coaſt, was founded by the Phocæans; and it is a probable conjecture to ſuppoſe, either that it was not the only ſettlement of that people, or that this was not the only nation of Greece that ſettled on this coaſt. The Grecian republics, too jealous of liberty, and being unable to ſubject one another intirely, piqued themſelves upon acquiring a number of allies, and upon founding many colonies. Theſe colonies were as ſo many fiefs formed under their dependencies, in countries where they could freely extend themſelves; and from theſe in troubleſome times they drew powerful ſuccours.

The territory of Genoa abounds with wine and oil, but is barren of all other fruits. Bounded on the ſouth by the ſea, and towards the north by the mountains, it is of ſmall extent. But the mountains ſloping a little on the ſide of Genoa, leave to that city a free communication with Piedmont, the Montferrat and Milaneſe. This ſituation, and the ungrateful nature of the ground, induced the Genoeſe to embark in trade, and enabled them to tranſport into the heart of Italy, and even into Germany, the commodities which they brought from all the coaſts of the Mediterranean.

Nevertheleſs, it was not under the Romans that Genoa became a trading town. The republic

lic of Rome, which after having rebuilt and reeſtabliſhed it, converted it into a municipal town, thought of nothing but extending its empire, and cauſing the land to be cultivated, without ever making trade an affair of ſtate. The ſpirit of grandeur it poſſeſſed, inſpired it with a conſtant diſdain for treaties of commerce, in which it muſt have neceſſarily owned as equals, thoſe princes and peoples whom it was reſolved to command: conſequently its trade did not extend but in proportion to the progreſs of its arms.

Genoa remained under the dominion of the Romans, until the Goths invaded Italy, and ſubdued it; but when theſe people were expelled, it returned to its dependence upon Rome. The Lombards afterwards ſettling in that country, ruined Genoa from top to bottom. Nevertheleſs it was re-eſtabliſhed, and fell under the empire of Charlemain in the year 774, when that prince extinguiſhed the kingdom of the Lombards. This new ſovereign created a count of Genoa: and in the ſequel it was comprized in the kingdom of Italy, which ſo long as the poſterity of Charlemain ſubſiſted, was the inheritance of the eldeſt, and annexed to the imperial crown.

In the time of Charlemain, the empire of the Saracens was in its full power. Theſe infidels had made themſelves maſters of the iſlands of Sardinia and Corſica; and Audimar firſt count of

Genoa, had orders to drive them from Corſica. He accordingly equipped a fleet, and landed in that iſland; and though he periſhed in the expedition, he who ſuceeeded him in the command of the army, happily atchieved the enterprize, and as the iſland was conquered by the forces of the count of Genoa, it became part of it from that day, and continued always attached to that city.

When the race of Charlemain was extinct in Italy and Germany, great troubles aroſe in Italy. Their long continuance, and the different revolutions which they occaſioned, inſpired different ſtates with the deſign of freeing themſelves from ſlavery, by aſſerting their own independence. The Genoeſe were not the laſt to form this reſolution: they expelled their counts, and created conſuls for the government of their city. Then being deſtitute of that aſſiſtance which ſubjects receive from their ſovereign, the neceſſity of ſubſiſting by themſelves obliged them to cultivate trade and navigation: for their territory being very narrow and barren, the new republic could find no reſources but in the profits of the ſea. She therefore applied herſelf vigorouſly to navigation, and though at that time, which was called the age of ignorance, the knowlege of ſea-affairs was very imperfect; nevertheleſs the Genoeſe acquired from continual exerciſe and application, ſuch capacity with regard to the ſea, that if they were equalled, they had no ſuperiors in that art.

Genoa

Genoa having ſet herſelf at liberty, was greatly diſturbed by the want of a title to independance, and inceſſantly apprehenſive that the emperors would revive upon her that claim the legitimacy of which was ſanctioned by her fears: and ſhe thought ſhe had done a great deal for her ſecurity, in obtaining in the year 958, of Berengarius II. emperor and king of Italy, the confirmation of her rights, poſſeſſions and privileges. We ſhall not examine whether this was a proper method for aſſuring her ſovereignty; it will be ſufficient to obſerve, that after this æra, the Genoeſe durſt not for a long time coin money, and when they erected a mint in the year 1139, they thought it their duty to aſk of Conrad II. the confirmation of that privilege, the moſt ſenſible mark of abſolute independance.

The Genoeſe having become powerful at ſea, were invited by the Piſans, who then formed a moſt illuſtrious republic, to join with them in order to drive the Saracens out of Sardinia: the Genoeſe conſented, the expedition ſucceeded; and that ſucceſs which one would think ought to have eſtabliſhed a conſtant friendſhip between the two ſtates, became the ſource of a jealouſy with which their hiſtorians mutually blacken one another, and of a long ſeries of wars which ended with the taking of Leghorn by the Genoeſe, and the total decay of the republic of Piſa, which was ſoon after melted down into that of Florence.

Meanwhile the Genoeſe extended their trade from Spain to Syria, and from Egypt to Conſtantinople: their ſhips according to the cuſtom of the times, were equally calculated and prepared for war and traffic; and being always in a condition to ſupport their intereſt by force, they acquired great reputation. But what raiſed them to the higheſt pinnacle of grandeur, was their being ſo neceſſary to the Cruſades. They not only drew immenſe ſums for the paſſage of the Cruſards, covered the ſea with their ſhips, increaſed their ſkill in navigation and the exerciſe of arms, but they penetrated with their trade into places which they had never before approached, and cauſed it to take ſolid and almoſt immoveable root in divers countries. The ſervice which the Genoeſe did the Cruſards, conſiſted not only in tranſporting them into the Levant: their fleets were loaded with proviſion, and ſometimes with their baggage, and coaſted along ſhore with the army in its march, during which their ſailors, ſoldiers, and engineers were often of ſingular uſe. They blocked up by ſea thoſe maritime places which were beſieged by land; ſometimes they landed their troops and joined the Cruſards; and finally, to them was owing more than once the ſucceſs of enterprizes, which without their aſſiſtance would have been attempted in vain. Theſe things they eagerly undertook without having taken the croſs, that is, to ſpeak in the language of thoſe times, without being engaged in the ſervice of God in

the holy land: a circumſtance neceſſary to be obſerved. The opportunity of carrying on a great trade, by furniſhing proviſions, arms, ſtuffs and every thing neceſſary for the Chriſtians in thoſe remote countries, where they had always the helmet on the head, and the lance in the hand; of puſhing that commerce into the heart of countries, which had been inacceſſible; of forming new connexions of traffic, or improving the old with thoſe princes whom the Chriſtians went to attack, were ſufficient motives for their intereſting themſelves in behalf of the Cruſards; and they were at certain conjunctures, able to give ſalutary advices to the Soldans of Ægypt, and do them ſuch eſſential ſervice, as gave the Chriſtians abundance of reaſon to complain of their conduct.

Nevertheleſs the kings of Jeruſalem, ſenſible of the great advantages they had reaped from the republic, were always heartily diſpoſed to favour it. The Genoeſe were dextrous enough to profit by this diſpoſition, and, under pretext of the ſecurity of their commerce, and the loſſes to which they were expoſed from the dangers of the ſea, they received from Baldwin I. two ſtreets in the city of Jeruſalem, and as many in Jaffa, with one half of the cuſtoms of Ceſarea Aleppo, and Ptolemais. Nor were the Genoeſe the only people to whom the Chriſtian princes of the Levant made ſuch conceſſions. The Venetians equally powerful, neceſſary and ſerviceable, at the ſame price, ſhared

in theſe imprudent favours. We ſee in the hiſtory how advantagious thoſe privileged places in the towns, were to the trade of theſe two nations, and how fatal they became to the chriſtians.

The Genoeſe wallowing in wealth, through the proſperity of their affairs in thoſe favourable times, at length began to find their limits too narrow; accordingly they made themſelves maſters of the country of Lavagna about the year 1113, and ſecured to themſelves the gulph of Spezia, upon the weſtern ſide of which they built the fort of Porto Venere: they ſubdued the counts of Vintimiglia, ſeized upon Montalto in the year 1128, and two years after built a citadel at San Remo. Such were the fruits of their wealth, which was itſelf the fruit of their liberty. But it was not long before they experienced the evils occaſioned by opulence and liberty, in a ſtate where the rich are under no conſtraint, nor the people reſtrained by the fear of reſpectable authority. From the beginning of the republic, the ſubjects were divided into the Nobles and Plebeians; theſe laſt being more numerous; but the others better qualified for managing affairs: nevertheleſs the form of government was democratic, and the conſuls were choſen by the people. In both theſe claſſes, which had no other connexion than the common intereſt of their country, powerful houſes were formed; and theſe houſes, eager and attentive to acquire partizans, and ambitious of honours and dignities, gave riſe to

to factions and domeſtic diſſentions, which were always bloody and pernicious. No people ever paid dearer for their liberty, than the Genoeſe. In vain did the government (by means of inteſtine factions) paſs ſeveral times from the people to the nobility, and return from the nobility to the people; in vain did they abrogate the conſulate, elect a foreign podeſtat, return to conſuls, reſume podeſtats, ſubmit to one or ſeveral captains under different titles, ſurrender themſelves to the emperors, the kings of France and Naples, the dukes of Milan, the marquiſſes of Montferrat, and at length create doges, ſometimes for life and ſometimes annually; they neither could accommodate themſelves to any one form of government, nor quietly enjoy the benefits which trade procured them in abundance. The ſole aim of the nobles was to cruſh the Plebeians, and theſe in their turn, uſed their utmoſt efforts to depreſs the nobles: the Adornos and Fregozas, the Spinolas and Dorias ſucceſſively, and as it were in emulation of one another, preyed upon the boſom of their country which was twenty times on the verge of total deſtruction. Foreign wars either with the Piſans or Venetians, put the finiſhing ſtroke to their misfortunes, becauſe they did not (as formerly at Rome) ſuſpend the fury of inteſtine troubles.

In reading the hiſtory of ſuch numerous events, one cannot comprehend how a ſtate almoſt always at war abroad, continually agitated and often turned

turned topſy-turvy at home, could ſupport itſelf; but the reaſon eaſily appears, when we conſider that the Genoeſe were ſtill gaining by trade, which at the ſame time ſupplied them with brave and ſkilful mariners; ſo that they had almoſt always the advantage over their enemies: they entirely abaſed the Piſans, and reduced Venice to ſuch extremity, that if their general had not impoſed too harſh conditions, they would have obtained a compleat triumph over it. Their naval victories ſecured their trade, which flouriſhed in proportion as their rivals were humbled: for at that time it was ſolely by the Genoeſe, Piſans and Venetians, that all Europe was ſupplied with the commodities of the Eaſt Indies by the way of Alexandria, and with thoſe of the Levant, by the ports of Phœnicia and Aſia Minor; and they only tranſported the merchandize of Greece and the coaſt of the Black Sea. Beſides, the revolutions of the Grecian empire, and the enfeebled condition of the Chriſtian princes in the Levant, furniſhed them with more than one occaſion of ſelling at a very high price their aſſiſtance, which was now more neceſſary than ever, and of making new and advantagious ſettlements.

In effect, when the French and Venetians united together, and conquered the empire of Conſtantinople in the year 1204, the Genoeſe, who always oppoſed the Venetians through a jealouſy of trade, declared for the Greek emperors: and Michael Paleologus, who by their aſſiſtance ſucceeded

ceeded in expelling young Baldwin the laſt French emperor in Greece, and in retrieving his own capital, gave them, out of gratitude, the ſuburbs of Pera at Conſtantinople, together with the city of Smyrna. About the ſame time, they were in poſſeſſion of Caffa, and ſeveral other places in the Black Sea: the emperor Joannes Comnenus gave them the iſland of Leſbos; they were maſters of Scio and ſeveral others in the Archipelago; and in a word, enjoyed very advantagious privileges through the whole extent of the Grecian empire. On the other hand, the diviſion of the Chriſtian princes, Syria, and their bad politics, having reduced them to an incapacity of reſiſting the Saracens, the Genoeſe availed themſelves of their ſituation for the advantage of their own commerce. They did not however always eſpouſe the intereſt of their trade in the ſuccours which they furniſhed, for fear of giving offence to the Soldans of Egypt, with whom it was of the utmoſt conſequence to them to live at peace, that they might carry on their trade at Alexandria with eaſe and ſecurity. When all the principalities on the main land in thoſe countries were deſtroyed, and the Chriſtians retained nothing but the iſland of Cyprus, where the houſe of Luſignan at that time reigned, the Genoeſe found means to ſettle on it, and even to maintain, the intire property of the city Famaguſta; nay they had almoſt made themſelves maſters of the whole kingdom. Loridano, a Venetian by birth, in his excellent hiſtory of the kings of Cyprus of the

houſe

houſe of Luſignan, recounts this event in a manner not very favourable to the Genoeſe, whom he accuſes of being the cauſe of the conqueſt of that iſland by the Soldans.

Be that as it will, (for it was of little ſignification to the Genoeſe whether or not they poſſeſſed a country, provided that the whole trade of it was in their hands) it is eaſy to conceive from that flouriſhing eſtate of the republic's foreign affairs, that the ſtrength it loſt in the troubles by which it was always agitated, was inceſſantly impaired by its external acquiſitions, notwithſtanding the bloody wars that were carried on in its boſom, and the numerous fleets and armies which it fitted out, and never wanted ſubjects, becauſe men are never wanting in thoſe ſtates where victory and ſucceſs in trade preſent them with a near proſpect of wealth and proſperity.

Under John de Morta, who was doge in the year 1346, the republic having put an end to a war with the Catalans, thought it neceſſary to undertake another againſt the Venetians, for the preſervation of the iſland of Scio; and it was at the ſame time threatned with a ſiege, by the remains of a faction which it had diſperſed. Theſe remains being exiled from Genoa, had retired to Monaco, where having uſed their utmoſt efforts, they equipped a fleet of nineteen gallies, with which they propoſed to go and attack Genoa,

noa, to enter it ſword in hand, and change the government at their pleaſure. This danger ſeemed the greater as the treaſury was exhauſted; and the republic could not find any remedy for this evil more efficacious than that of ſelling part of its revenues to thoſe citizens who were inclined to purchaſe. The produce of this ſale, enabled the commonwealth to equip twenty ſeven gallies, at ſight of which the exiles abandoned Monaco, and ſailing to France, engaged in the ſervice of Philip the fifth: while the republic, free'd from the uneaſineſs which they had occaſioned, ſent its veſſels into the Archipelago, to defend Sciro againſt the enterprizes of the Venetians.

The moſt obvious revenues of the ſtate were the cuſtoms, the offices of which were kept in a vaſt building called the houſe of St. George. It was part of the produce of this cuſtom that was alienated; and every individual touched a certain annuity for the ſum he advanced, higher or lower, according to the riſe or fall of the general receipt of the cuſtom. This firſt alienation has ſince been followed by ſeveral others, and the proprietors of the bank of St. George now form a conſiderable body. We ſhall expatiate upon this ſubject more at large in the ſequel.

If the republic found itſelf more than once obliged, as we have ſaid, to alienate different parts of the revenues of its cuſtoms, it was not ſo

much

much on account of the troubles that continued to agitate her, as the interruption of her trade, when the power of the Turks was formed and aggrandized with ſurprizing rapidity. The ferocity of theſe conquerors, and the violent hatred they bore the Chriſtians, rendered them inſenſible to the conveniencies and pleaſures which they might have enjoyed from trade. In every country, therefore, through which they extended their dominion, the Genoeſe loſt their ſettlements; and notwithſtanding all their addreſs, ſome time neceſſarily elapſed, before they could freely return to thoſe places from whence they had been baniſhed. But when their hopes were revived with their trade to the eaſtward, though upon a much weaker footing than in times paſt, things began to aſſume a more diſadvantageous aſpect for them in the weſt. The French having diſcovered part of the coaſt of Africa in the Atlantic Ocean, had been ſurpaſſed by the Portugueze, who reconnoitred thoſe coaſts as far as the Cape, of Good Hope; and ſoon doubled that Cape in emulation of the Spaniards, who likewiſe made ſettlements in America, and, together with the Eaſt Indies, diſcovered all the iſlands in the Indian ocean. The ſpices and other goods brought from thence, turning to much better account than thoſe that were formerly furniſhed at Genoa and Venice, they no longer purchaſed them of theſe two cities, and the faireſt branch of their trade was ruined all at once. To crown the misfortune of Genoa, the grand ſignior having been informed that

that there were ſome Genoeſe gallies in the battle of Lepanto where his fleet had been deſtroyed, prohibited all Genoeſe veſſels from being received in his ports.

Any perſon ſeeing this republic loſe, almoſt at the ſame time, all its trade to the eaſt and weſt, and preſerve nothing but domeſtic diſſention and inſtability in the government, would believe its ruin equally near and inevitable. And certainly it never could have avoided it, if all the virtues of which human nature is capable, had not been found united in one of its citizens, and diſplayed in its behalf. I mean Andrea Doria.

The republic of Genoa had for the ſixth time put itſelf under the protection of France, when the emperor Charles V. undertook to wreſt it out of the hands of Francis I. Octavian Fregoſa was then doge and governor for the king: he for a long time, reſiſted the imperial army commanded by Proſper Colonna, and the marquiſs of Piſcaro, who were joined by Jerome and Antonio Adorno: but at length the city was taken and pillaged, and the ſtate reduced under the dominion of the emperor. Francis I. ſent troops to retake it: his army took poſſeſſion of the weſtern ſide, but was too weak to attempt the ſiege of Genoa, becauſe Francis at that time had aſſembled almoſt all his forces in the Dutchy of Milan. However, in order to weaken the republic, he fortified Savona anew, and there propoſed to

eſtabliſh a trade which ſhould rival that of the capital. The conſtable Montmorenci, on whom he beſtowed the cuſtoms, ſupported with all his power, a project ſo advantagious to himſelf, and, for the misfortune of France, had afterwards credit enough to hinder this place from being reſtored to the Genoeſe. For Francis I. having been taken priſoner at the battle of Pavia, the proſperity of Charles V. alarmed even his own allies, who eſpouſed the cauſe of France, joined her ſhips, and came to beſiege Genoa. Andrea Doria, who had always been, and then was in the ſervice of France, commanded the pope's gallies at this ſiege, and by intercepting the convoys, contributed not a little to the reduction of the town, which Lautrec beſieged by land. He was the greateſt ſea-officer of his time. When the city was ſurrendered, the Genoeſe hoped that the king would give them back Savona, the trade of which diſquieted them extremely; but the intereſt of the conſtable oppoſed them with too much ſucceſs, and they could not obtain this ſatisfaction, notwithſtanding their preſſing entreaties, and the repeated ſollicitations of Doria. It was not without chagrin that they ſaw themſelves diſappointed in their hope, and Doria was too good a citizen not to ſhare their mortification. He had always continued ſincerely attached to France, becauſe the Genoeſe were convinced by experience, that the republic had never enjoyed more quiet than under the dominion of the French. But the conduct of that crown changing with reſpect to them, by the retention of Savona,

Savona, which threatned the trade of Genoa with abſolute ruin, their diſpoſitions underwent an equal change. Some private diſcontents fortified in the heart of Doria, the reſentment he felt for his country's danger, and he reſolved to contribute in another ſenſe, towards the happineſs he wiſhed to ſee it enjoy.---- With this deſign he turned his eye upon Charles V. and in that prince found all the ſupport and protection he wanted. The emperor, charmed with an opportunity to deprive his rival of ſuch a great man, and in the acquiſition of Genoa, to take from the French the footing they had in Italy, not only promiſed to ſupport and aſſiſt him with money, but even to make him ſovereign of his country. Andrea Doria was worthy to fill that high rank, had he been raiſed to it by the unanimous voice of his countrymen; but he had too much virtue to uſurp it, and his heart was too noble to receive it from the hands of any foreign prince. He accepted therefore the ſuccours of Charles, to vindicate the liberty of his country, and made no other uſe of the power that was in his hand, than that of extirpating domeſtic diſſentions, and giving a ſolid form to the government.

One circumſtance favoured the execution of his enterprize. The plague raged in Genoa; and the fear of being infected had induced Theodore Trivulci, the governor, to retire into the caſtle; and his garriſon, in conſequence of this example, were diſperſed. In this conjuncture, Doria, who

was at ſea, approached Genoa with thirteen gallies, the ſight of which intimidated Barbeſieux commandant of the French fleet, which then cruiſed before the port in ſuch a manner, that he fled to Savona; while Doria landing five hundred men, máde himſelf maſter of the city, without any reſiſtance. The event was no ſooner known, than the principal perſons of the ſtate, haſtened to join him, from their country-houſes, to which they had retired. The plague ceaſing that very day, they loſt no time in finiſhing the work ſo happily begun. Savona was in a little time beſieged and taken; Trivulci was obliged to ſurrender the caſtle which was taken and razed; Gavi and Novi were recovered, together with all the places occupied by the French, who could not oppoſe their progreſs, by reaſon of a deſertion among their troops, occaſioned by a failure of payment.

After having thus reſtored the fulneſs of liberty to his country, by his prudence and exploits, nothing remained for Andrea Doria to do, but to ſecure it in the peaceable poſſeſſion of that liberty, by new and wholeſome laws. We have obſerved in the beginning, that the citizens of Genoa were divided into Nobles and Plebeians: now, as theſe two orders acquired great wealth by trade, and as it was impoſſible to riſe from the inferior to the ſuperior claſs, an eternal jealouſy naturally ſet the ſecond in oppoſition to the firſt. This emulation was the cauſe of thoſe troubles which have ſo often changed the face of the go-

vernment. The Nobles becoming powerful, cruſhed the Plebeians, who becoming rich, roſe in their turn, and wreſted the authority from the hands of the Nobles. Fatigued with theſe repeated revolutions, which threatned them with being in a little time ſubdued by foreign princes, whoſe power daily increaſed, the Genoeſe at length reſolved to find ſome expedient for totally quelling ſuch dangerous diſſentions. But they had not as yet found the proper means, when at the period we have mentioned, they were beholden to the generous Doria for the greateſt of all benefits, and learned of him how to preſerve it, at the ſame time. By his advice, and without any regard to the Adornos, Fregoſis, the Guelphs and the Ghibellins, they formed a general liſt of all the citizens, in order to diſtinguiſh thoſe who had ſix families in Genoa, the Adornos and Fregoſis being excepted in a ſpecial manner, and of thoſe were found no more than twenty eight. Under theſe eight and twenty families all the other citizens were ranged, as well the Nobles as the Plebeians, who deſerved ſome conſideration, and who were of conſequence, raiſed to the rank of nobility; and it was decreed, that every year, ten families ſhould be taken from the claſs of the people, and added to this body of the eight and twenty ſuperior claſſes. By theſe means the people remained at that time, and ever ſince weak and deſtitute of wealthy families capable of forming factions; and the body of nobility into whoſe hands the government is fallen, found itſelf ſo powerful, that it has nothing

to fear from the populace. This, therefore, was the æra that put an end to the inteſtine troubles of the republic; for, the conſpiracies which have been unſucceſsfully formed in the ſequel, ought to be regarded as nothing elſe than the remains of the former fermentation. It was at the ſame time decreed, that a doge ſhould be elected every two years, and a form of election was preſcribed, which they judged the moſt proper for preventing cabals. They likewiſe created a council of five *ſupreme cenſors*, whoſe function conſiſted in examining the conduct of thoſe who went out of office; with power to puniſh them if they ſhould be found culpable. Theſe cenſors were to remain four years in office, and then to be changed by a new election. But as the public good was thought to require that Andrea Doria ſhould be one of theſe cenſors, in conſequence of the diſtinction which he ſo juſtly deſerved, that office was conferred on him for life. The gratitude of the republic did not ſtop at this favour: it erected a ſtatue in honour of that incomparable citizen, whoſe zeal and courage had reſtored it to liberty, and whoſe wiſdom had dictated thoſe laws which have preſerved its happineſs and peace to this day. Oppoſite to this, is another raiſed in honour of his nephew Andrietta Doria, who worthily walked in the ſteps of his uncle, and did ſignal ſervices to the ſtate. Finally, to immortalize the memory of that happy conciliation, in the year 1528 they eſtabliſhed an annual feſtival, under the name of the *Feaſt of the Union*, which the Genoeſe yearly celebrate

celebrate with all poſſible mirth and magnificence.

After having ſettled all the regulations neceſſary for re-eſtabliſhing and maintaining internal order, they deliberated upon ways and means for promoting trade, without which the ſtate could not ſubſiſt. Times were greatly changed. The trade of the Levant was prohibited to the Genoeſe; and that of Europe almoſt entirely ruined; ſo that they could not ſupport themſelves without finding in their own induſtry and addreſs, reſources equal to the loſs they had ſuſtained. This aim they accordingly accompliſhed, by cultivating the arts, and ſetting up a great number of manufactures.

The expedient they uſed for ſhewing themſelves anew in the Levant, was to ſail under the colours of Jeruſalem. This is the banner of the brotherhood of Jeruſalem, which ſubſiſts to this day in the church of the reverend fathers Cordeliers at Paris. After the laſt expedition of St. Lewis to Africa, another cruſade was formed, but never put in execution. The noblemen who had taken the croſs, in great numbers, to reconquer the kingdom of Jeruſalem, did not drop the deſign, notwithſtanding the obſtacles which the wars of thoſe times raiſed againſt their departure; they continued ſtill united in a confederacy and brotherhood, under the name of Jeruſalem, and were careful in aſſociating new brothers in the room of thoſe who were taken away by death; and thus

the body hath been perpetuated even to our days. But the hope of being able to carry on the war in the Holy Land, diminiſhing more and more, noblemen have at length ceaſed entering into that aſſociation, which has very much degenerated accordingly.

The Genoeſe, under the ſtandard of this confederacy, traded to great advantage in the dominions of the Grand Signior, when they ſaw themſelves thwarted by the deſigns of France. The taſte for trade beginning to gain ground among the warlike nations of Europe, the king's miniſters perceived that the commerce of the French was hurt by that of the Genoeſe. Immediately the ambaſſador of France at Conſtantinople, obſerved to the Ottoman Porte, that the Genoeſe who were not allies of France, ought not to profit by the privileges of a flag which was under its protection: and in conſequence of this repreſentation, it was ordained that no Genoeſe veſſels bearing theſe colours, ſhould be admitted into their ports, if they had not the enſign of France. They were therefore obliged to renounce the trade, becauſe it was impoſſible for them to be, at the ſame time, the friends of France and the houſe of Auſtria, which were continually at war with one another. Beſides, they thought it their intereſt to be united with this laſt power, which having the greateſt authority in Germany and Italy, being in poſſeſſion of Spain and the richeſt parts of America, and utterly neglecting trade, afforded

afforded them all the advantages they could deſire.

In effect, they brought linen and other commodities from Germany, by the way of Milan, and ſold them again in Spain, as well for the occaſions of that kingdom as for tranſportation to the Weſt Indies: and they now carry on the ſame trade with the ſame ſucceſs. The money ariſing from thence, ſerves to maintain their trade in the Levant; for notwithſtanding all the difficulties that have been oppoſed to them, they have never loſt ſight of thoſe rich countries. Without exporting merchandize thither, they go and purchaſe commodities, for which they pay ready money; and are therefore very agreeable to the people. They never want the protection of the conſuls of ſeveral European nations, to ſecure a free entrance for them into the ports: by theſe means they furniſh themſelves with the raw or unwrought materials of the Levant, which they carry off and manufacture at home; and the attention which they beſtow upou their manufactures, has revived their trade with Europe, in another branch. Their ſilk ſtuffs, but eſpecially their damaſk and velvet, have met with a prodigious ſale; and Genoa alone ſupplies Spain with paper, of which they have a conſiderable conſumption: while, in order to maintain their paper-works to the number of 150, they tranſport materials from Spain, Italy, and in a word from every place where they can find them. As the produce

produce of the earth is not ſufficient for one fourth of the conſumpt of the country, they buy corn, wine, oil, from the Levant, and all ſorts of proviſion, which they lay up in ſtores; and often, in times of dearth, ſell them again to thoſe very people from whom they were purchaſed. No commodities pay entry at Genoa, but thoſe which are deſtined for the city itſelf; all others are free, and carried into the warehouſes called the *Free Port*, oppoſite to the houſe of St. George, which warehouſes the republic lets to the merchants. On this occaſion they commit ſeveral frauds, which have not as yet been remedied. As the republic has offices and clerks at Gavi, to keep an account of all the commodities that are exported from the ſtate, in order of know whether the merchants do not vend in the country; theſe laſt find it an eaſy matter to gain over the clerks to ſign a certificate for the export of ſuch ſpecies and quantity of merchandize, as they deſire, and privately ſell the ſame commodities in the ſtore to thoſe who come to aſk for them. When they are detected in this contravention, the penalty is ſo ſlight as not to deter them from repeating the practice. The duty of entrance for the city of Genoa, is ten per cent. of the price, according to the valuation by one of two officers who are appointed for that purpoſe, and two per cent. beſides for the duty of convoys, which formerly eſcorted the ſhips: and though this cuſtom is aboliſhed, the duty ſtill ſubſiſts.

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The ſhips of Leghorn pay ten per cent. more than others, on account of a grudge of the republic, which it is neceſſary to explain. The Genoeſe had been long in poſſeſſion of that town, which they conquered from the Piſans, when the duke of Florence propoſed to them to exchange it for Sarzana. Several ſenators had acquired great fortunes in the territory of Sarzana, and were chagrined to ſee this part of their eſtates in the dominion of a foreign princes: ſo that, when the affair was brought before the council, the intereſt of private perſons prevailed over that of the ſtate, and the exchange was accepted. But when the grand duke had made Leghorn a free port, and the merchants were eagerly buſy in ſettling their ſtaples in that town, the republic perceived their error in its full extent: and the ſole remedy they could contrive was to double the duty of entrance upon the ſhips of that port, in order to prevent the merchants who trade at Genoa, from putting into Leghorn.

The reſort of merchants to Genoa, is greater than in any other port of Italy, Venice itſelf not excepted. In vain the different princes who ſhare that fine part of Europe among them, have made their utmoſt efforts to diminiſh this concourſe; neither the privileges they have granted, nor even the advantage of procuring a greater ſale of merchandize by a ſaving in the freight, have determined the merchants to abandon Genoa. Thither

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they crowd, not only from France, Spain, England and Holland, but even from Denmark, Sweden and Poland. Genoa is the principal magazine of Italy; the Romans, the Neapolitans, Venice and Trieſte, take from thence part of what they want, and there find every thing they deſire. What attaches the merchants to this city, is the facility they find in borrowing money at a moderate intereſt, when they have occaſion for it, without being obliged to ſell their goods at a diſadvantage. The wealth and œconomy of the Genoeſe, and the allurement of a certain profit, afford theſe never-failing reſources to the trader, who cannot find them in any other place.

The induſtry and activity of the Genoeſe, who ſpread themſelves almoſt through the whole habitable earth, where there is any thing to be got, ſoon gave a new luſtre to their trade. The funds acquired by private people upon the cuſtoms of the houſe of St. George, gradually took ſuch a favourable turn, that before the laſt war they gained twenty per cent. that is, the ſeller had 120 livres for 100 livres of ſtock, although the republic had fixed the price at 115. In the ſame houſe of St. George they have eſtabliſhed a bank, in which individuals depoſite their money, and take bills for the ſum, which are exactly paid either in Genoa, or in any other country. The advantage which the ſtate reaps from this ſcheme, beſides that of facilitating commerce, is in the ſums, which are never reclaimed, when the proprietors periſh

periſh by ſome accident which does not permit them to convey or mention their ſtock. But the misfortunes which Genoa has lately ſuſtained, have drained the funds of the bank, and lowered thoſe of the houſe of St. George to ſuch a degree, that inſtead of gaining twenty per cent. as formerly, they now loſe five and twenty per cent. Yet there is great reaſon to hope, that matters will ſoon be re-eſtabliſhed among ſuch a frugal and intelligent people. Indeed the ſenate, after many deliberations, have taken ſuch meaſures as appeared moſt proper for re-eſtabliſhing the credit of that bank, which is about 13 millions in arrears. The junto of the proprietors has been put upon the ſame footing it had before the war. It is compoſed of three ſenators, five nobles, and five deputies from the body of the merchants. They have laid upon the ſtock and commodities, taxes which will be moderated or aboliſhed when the affairs of the bank ſhall have recovered their former vigour. The republic has obtained of the king, that the ports of France ſhall have no particular office, and that the couriers ſhall alight at the general poſt-office, which will prevent a contraband trade privately carried on by the ſeveral perſons, eſpecially in ſtuffs and lace from Lyons. In a word, they have eſtabliſhed what they call a *Mount of the conſervation*, where the notes of the bank of St. George are received in payment, without being carried to the exchange, and where each perſon may depoſite his money. Every action

action great or ſmall, upon this *Mount of the conſervation*, bears an annual intereſt of three per cent. until the capital is re-imburſed. By theſe regulations, the republic is in hope of retrieving the credit of the bank, and reſtoring to the trade its uſual activity. We will not, however, diſſemble our thoughts touching ſome obſtacles that ſeem to oppoſe the recovery of its ancient and ſolid ſplendor. Theſe are the exceſſive thirſt after gain that reigns among the rich, and the rigour of the laws againſt debtors, in favour of creditors. The Genoeſe are naturally œconomiſts, and never ſpend one third of their income. Conſequently they amaſs large ſums, which they place out at intereſt upon good ſecurity. Their eager deſire after profit of this kind, hath rendered them hitherto blind to their real intereſt. Inſtead of keeping this money among themſelves, they ſend it to foreign countries, ſuch as Rome, Venice, Vienna, and other places, where they run the riſque of divers accidents. Thus they reſtore to foreigners, what they have gained from them, and by expoſing themſelves to all the revolutions which may happen in thoſe ſtates where they place their money, they ſeem inclined to take upon their ſhoulders all the misfortunes of Europe. It is, therefore, difficult to believe that this republic will ever recover the ſtrength it had in paſt ages, ſince it deprives itſelf of the very means which conſtitute that ſtrength.

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The ſame avidity of gain which never ſubſiſts without the fear of loſs, will not permit them to lend money to their own merchants, except at exorbitant intereſt; and when the day of payment comes about, which is always that of the ſhip's arrival at the place of its deſtination, they preſs the merchant in ſuch a manner for the capital and intereſt, that they will ſcarce allow him fifteen days to look about him. The merchant, thus deprived of the liberty of waiting a favourable time for ſale, is often obliged to part with his goods at an under-price, and finds himſelf a loſer, after having ſatisfied the inexorable creditor, who carries off his whole profit.

On the other hand, there are in the ſtate of Genoa, privileged notaries, who are ſuppoſed incapable of prevarication. This infallibility they acquire when they are touched by the doge; and this ceremony being once performed, the bonds which they execute alone, without any other notary, witneſs or ſignature of parties, have the ſame authority as thoſe which are ſanctioned by all theſe eſſential formalities. Whence it happens, that when a rich man, deſirous of plundering another of his fortune, has gained over one of theſe notaries, the poor victim finds himſelf a debtor, without ever having been a borrower, and ſees himſelf ſeized for a ſum ſtill leſs than that of the unjuſt demand: for, ſuch is the general law, that the creditor can ſeize the effects

of

of his debtor for two thirds of their value; this is called the law of *three for two*. Now, as no money is lent without intereſt, and this uſury is permitted, the creditor never fails to join the intereſt to the principal, and for a ſum (for example) of 6000 livres, takes in execution effects to the value of 9000. True it is, the debtor may in juſtice demand a delay of payment: but it is eaſy to ſee that when the debt is real, he will ſeldom be able to preſerve his effects; for, when his circumſtances allow him to pay, he never waits to be dunned by his creditor; and when he is preſſed, it is a ſure ſign that he is unable to pay. It is in conſequence of this law, that the effects belonging to the people of the valley of Polſevera, have almoſt wholly fallen into the hands of the Genoeſe nobles, whoſe old maſters are no more than farmers. The republic may know by late experience, the fruit ſhe may expect from the uſury ſhe allows, as well as from a law ſhe has no intention to abrogate.

Yet ſhe has before her eyes, and even in her own territory, a very ſtriking example of the advantages that reſult from a contrary conduct, a remarkable ſtory with which we ſhall finiſh this eſſay. Near Cape de Melle, upon the ſea-coaſt, is a village called Lenguella, which fifty years ago did not exiſt. It owes its origin to one fiſherman, who about that time ſettled on the ſhore; and being afterwards joined by ſome of his companions, they altogether carried on a trade for fiſh,

fiſh, which for ſome time they ſold along the coaſt, as far a Genoa on one ſide, and Marſeilles on the other. Their unanimity and the mutual aſſiſtance they gave to one another, ſoon put them in a condition to undertake ſomething more conſiderable, and to tranſport commodities from one place to another. Though the ſituation of their new ſettlement, which is no other than an open ſhore, defended only from the ſouth-weſt wind by Cape de Melle, together with their narrow circumſtances, would not permit them to have any other veſſels than ſmall pinks, their courage, induſtry, ſucceſs in trade, and continual practice, have learned them to uſe theſe veſſels to ſuch advantage, that at this day there are not more bold or dextrous navigators than thoſe of Lenguella. They not only ſailed through the whole Mediterranean, and adventured upon the ocean; but even the Black-ſea, ſo dangerous to others, had nothing frightful to them. They navigate through it without fear; they penetrate every where by means of their ſmall veſſels, they go on ſhore in all places, and in all parts of it carry on a trade which nothing is capable of interrupting; for having found the art of doubling the ſurface of their ſails, they ſeem to fly through the waves, and always eſcape the beſt ſailing corſairs that give them chace; there is no inſtance of one of their ſhips being taken. This proſperity is maintained by a wiſe cuſtom they have eſtabliſhed, of ſharing among themſelves the loſs as well as the profit. They are enemies to

 uſury;

uſury; ſo that the conditions are equal and the obligation reciprocal in all their engagements; and by the double effect of the natural law from which they are afraid to deviate, as the gain is not without riſque, ſo the loſs is not without reſource. But their dexterity in ſea-affairs, their activity and underſtanding in trade, ſecuring them in a great meaſure from unfortunate accidents, the ſucceſs of the greateſt part of their undertakings eaſily covers the miſcarriage of ſome, and their trade is always in a flouriſhing condition. The village of Lenguella, therefore, continually increaſes, and is now a conſiderable place; and this it neither owes to the advantage of its ſituation, nor the aſſiſtance of San Remo, which is in its neighbourhood, nor to any privilege which hath been granted to its inhabitants, but ſolely to their equity and wiſdom. They have already ſixty veſſels; already they have among them ſeveral inhabitants who go no more to ſea, but are concerned in equipments, from which they draw a pretty certain revenue, which they prefer to landed intereſt. At Lenguella they ſeldom embark leſs than 600 livres upon a veſſel, and this concern is properly ſpeaking an action which is paid at the arrival of the ſhip, with profit or loſs according to the ſucceſs of the voyage: the ſailors have nothing certain but their maintenance, in the voyage, but they are allowed to have a ſmall adventure; and in the neat profits of the equipment, they are accounted ſtock-holders for 600 livres, each,

each, and ſhare on that footing with the other owners: if the voyage is unfortunate, their loſt time and trouble are reckoned in lieu of their ſhare of the outfit. We may therefore judge with what ardour they are animated; and what courage, ſtrength, and addreſs they derive from the fear of working to no purpoſe, and the hope of gaining ſome ſtock without any expence.—— If this new people had a good harbour, it would be an eaſy matter for the politicians to prognoſticate for them a fortune ſtill more brilliant than that love for their country which already ſhines among them: for already ineffectual efforts have been made to engage ſome young men of Lenguella to ſettle at San Remo, where they have been offered the moſt honourable matches in the town.

Inquiry concerning the Materials that may be uſed in making Paper. By Mr. GUETTARD, of the Royal Academy of Sciences, and Phyſician to his Serene Highneſs the Duke of Orleans.

PAPER owes its origin to the neceſſity that mankind were always under to communicate their ſentiments even when at a diſtance from one another; and to the deſire of tranſmitting their thoughts to poſterity. Flattered with the hopes of procuring by theſe means a kind of immortality, which would indemnify them for that which nature hath refuſed, they firſt thought of carving or painting upon the bark or leaves of trees, the characters which they uſed. The natives of America ſtill uſe the ſame expedients; and theſe may be looked upon as a living proof of what is recorded of the firſt men of the old world. They found inconvenience in having books compoſed of ſmall bits of bark ſtrung upon twiſted leaves, or on one piece of bark or leaves rolled up; and endeavoured to find another matter which might be more commodiouſly uſed. The Egyptians, who were the firſt people that enjoyed

joyed the happineſs of a well governed ſtate, were likewiſe the firſt who endeavoured to procure this advantage; nevertheleſs, it was not (according to Pliny) till the time of Alexander's victories, that they made this diſcovery. They fell upon a method of making, from a kind of dog-graſs, a ſubſtance which ſoon became a very conſiderable and lucrative branch of trade; and this manufacture was the firſt thing that deſerved the name of paper. Rome, as much as it was poſſible, furniſhed itſelf with this paper, and as often as the Gauls could procure it, they gave it the preference to the birch-bark: but the difficulty of bringing it from ſuch a diſtant country as Egypt, weighing too equally againſt its rare property of taking any deſired form, and of being folded together in ſheets, the Gauls and other nations endeavoured in like manner to find the means of ſupplying it among themſelves. They accordingly found the method of making it with cotton: and according to Montfaucon, in his eſſay upon the Egyptian paper, inſerted among thoſe of the academy of the belles lettres, at the end of the ninth or beginning of the tenth century, this deſtroyed the Egyptian paper manufacture through all the eaſt; and this diſcovery led to that of our paper, which is made of rags, the æra of which, as ſettled by Montfaucon, in the aforeſaid eſſay, is in the twelfth century. Yet long before that period, the Chineſe (according to P. du Halde) made it with cotton rags. That author ſays, in the article of Chineſe

paper, that in the 95th year of the Chriſtian æra, a Mandarin of the palace manufactured paper of the bark of different trees, old rags of ſilk and hemp that had been uſed. Be that as it will, as ſoon as the rag-paper appeared, it ruined the Egyptian paper in the weſt, as the cotton-paper had formerly ruined it in the eaſt. We muſt own however, that the advantages of paper made of rags, ought not to have been ſo fatal to that of Egypt, but on the contrary engaged their manufacturers to bring it to perfection. Every thing ſeemed to lead the way. The different kinds of paper had always been made of plants: and although the birch-bark and the prepared leaves, were not properly ſpeaking of that ſpecies, yet the facility of folding and rolling, ſhewed a flexibility in the fibres, capable of that preparation which is given to rags. It may be obſerved, that theſe very rags are no other than fibres of a plant which had ſuffered a kind of decompoſition, which had not happened to thoſe that they made uſe of. It was therefore natural to think, that if they had undergone the ſame preparation, they would have produced ſuch a paper, or at leaſt a kind that would have reſembled our own.

Let us not ſeek for matter of reproach againſt the ancients. Their occaſions for paper were not probably ſo preſſing as ours; ſince notwithſtanding the quantity of rags which is collected, the price of it ſometimes riſes ſo high, that the manufacturers are deſirous of finding other materials for

for the ſame purpoſe, or compelled to have recourſe to expedients which are prohibited by the regulations touching paper-works, though they always find means to conceal them from the vigilance of the inſpectors. When the rags that are proper for making white paper, become ſcarce, they employ thoſe which at other times, are uſed for the coarſe paper, and prepare them with chalk-water. By this preparation they conſume, and indeed deſtroy the foreign bodies which are in theſe coarſe materials, but at the ſame time decompoſe the fibres of the rags; ſo that there muſt certainly be a great waſte. If we ſhould do no more then, but find a method for preventing this waſte, and procure ſuch materials as the workmen at ſuch times deſire to have, ſhould we not gain a great advantage to the paper-works? The means that are now prohibited, might be employed after the prohibition is taken off. This new matter might be uſed for coarſe paper, and the other enter into the compoſition of white paper, and of conſequence the price of fine rags would fall, or at leaſt never become exceſſively dear. In my opinion, therefore, we ought to have been for a long time, employed in ſearch of a remedy for thoſe times of dearth, and in preventing the conſequences ſo naturally drawn from the manner in which we now manufacture our paper. It is not from the workmen we are to draw ſuch conſequences. He himſelf who makes any diſcovery, very rarely perceives all its conſequences: the novelty often blinds us,

touching what is already diſcovered, and makes us deſpiſe it, inſtead of engaging us to bring it to perfection. It therefore requires men who, together with a diſcerning underſtanding, have a deſire to bring the arts to perfection, and to enable mankind to enjoy them at a ſmall expence.

M. de Reaumur, in an eſſay publiſhed in the year 1719, upon waſps, ſeems to perceive theſe conſequences. Waſps build habitations, the outward parts of which ſeem to be of paper or ſtrong paſteboard: in ſuch a manner do they prepare bits of rotten wood, as to make them aſſume that conſiſtence. M. de Reamur took an hint from this obſervation, touching the perfection of paper-works. He in his eſſay explains his own ideas of that ſubſtance, and wiſhes thoſe who have an opportunity would examine, if it is ſuch as he has conceived it to be: and this ſubject he has renewed in the ſixth volume of his hiſtory of inſects. Seba likewiſe, in the firſt volume of his natural hiſtory, has invited the curious to proſecute the ſame project, in theſe words. "This "country does not ſeem to want trees fit for "making paper, if people would give themſelves "the neceſſary trouble and expence. *Alga Marina*, "for example, which is compoſed of long, ſtrong, "viſcous filaments, might it not be proper for "this purpoſe, as well as the matts of Muſcovy, "if they were prepared as the Japoneſe make "their

"their timber? The curious may at leaſt try the "experiment." Whether there are no people, as Seba demands, who have opportunities of proſecuting this work, or that every body is averſe to go to work, except upon his own plan, I know not one author who has communicated any thing upon this ſubject.

P. du Halde, in the firſt volume of his hiſtory of China, pretends that the Chineſe make paper of the ſecond bark of bamboo, of the bark of different trees, particularly the mulberry, of ſtraw, rue and hemp. Keempfer, in his voyage to Japan, and after him Seba, in the aforementioned book report that paper is made in that country of the inner bark of a kind of mulberry-tree. M. de la Loubaire ſays, that the Siameſe make it of old cotton-cloth, or the bark of a tree called *Toncoë*. Flacourt deſcribes the manner in which the inhabitants of Madagaſcar make theirs of a kind of mallow, which they call *Avo*. Finally, all the travellers to India as well as to America, recount with emphaſis, the advantages drawn from the palm tree for making ſtuffs, of which, when they are worn, it would doubtleſs be eaſy to make paper. The opportunity which the paper mills in the neighbourhood of Eſtampes, which is my native place, ſeemed to afford me, of fulfilling the wiſh of ſome, and verifying what hath been ſaid by others, touching our trees and plants that are analagous to thoſe mentioned by the authors above,

above, has induced me to collect ſeveral of theſe plants. After having ſurmounted all the difficulties which one always finds among workmen, when he pretends to introduce any novelty relating to their occupation, I have at length, ſucceeded ſo far as to have tried ſome experiments, and flatter myſelf with being able to continue thoſe which I have in view.

Hitherto I have only ſpoke, as if paper was made of nothing but vegetable ſubſtances, and that no materials could be taken from the animal reign. Nevertheleſs, it is doubted whether in China paper is not made of ſilk. Pere du Halde ſays, that they gather the refuſe cods, when they are unwound in the ſilk manufactures, and make paper of them; but, notwithſtanding the aſſertion of that author, the fact has been always conſidered as problematic.

I will relate an experiment which may help to explain this queſtion: but before I deſcribe my ſucceſs, I believe I had better diſtinguiſh the different plants I have mentioned above, and preſent them in a methodical manner. By theſe means the public will have a botanical hiſtory of paper, and ſee the plan of the work which I have propoſed.

The materials for paper, then, may be divided into two general claſſes, namely vegetable ſubſtances,

ſtances, and thoſe that belong to the animal kingdom.

In the great number, I will even venture to ſay, in the confuſion of plants uſed for making paper, or of which people ſuppoſe it might be made a regular order may be found. People of different countries have been conducted by a kind of natural analogy. They have not ſought to employ plants that were very different from thoſe already in uſe. They have taken them of different claſſes, in different kinds, but always in ſome of thoſe which had been before uſed, though probably they were ignorant of that circumſtance. In effect, the greateſt part of plants ſeem to be compoſed of long, longitudinal fibres, nearer or cloſer to one another, and covered with a ſubſtance which fills up the intervals: ſuch are the *palmiferous*, the *gramineous* and the *liliaceous*.

The claſs of the *palmiferi* is one of thoſe which have been of moſt ſervice to the Indians, Aſiatics and Americans, in furniſhing them with cloathing, cordage, ſails and other utenſils; almoſt every part of theſe trees, has ſerved ſome of thoſe uſes, though they do not indifferently take every part of the ſame tree. Theſe people have in the palm-tree, which they found among them, choſen what was moſt ſuſceptible of manufacture. In ſome they choſe the *ſpatha*, which invelops the *regimen* of fruits before they are ripe, or that which ſuſtains the young leaves: and in others they employed

ployed the down which ſurrounds the fruit. The young and tender leaves have been preferred to this wool or down, which was not conſiderable in other kinds; and when all theſe could not be compared to the bark for goodneſs and quantity, they made uſe of this laſt. The down of the fruit of the cocoanut-tree, the *ſpatha*, the leaves and bark have been uſed, as ſeveral travellers relate. Rumphius, in his hiſtory of the plants of Amboyna, ſays as much of the *calapa*: the *pinanga*, the wild *lontarus*, the *tetum*, the *hakum*, the *wanga*, all different kinds of the palm-tree, furniſh in their leaves, a thread more or leſs fine, of which thoſe people make ſtuffs. They have even prepared the leaves of the *hakun*, and *ſoribe*, and uſed them inſtead of paper. The advantages which the Indians draw from the palm-tree being already ſufficiently important, I ſhall not probably be blamed for not having inſerted, in the number of theſe advantages, what is mentioned by Rai after ſome authors: he reports, tome 11. page 358. of his hiſtory of plants, that the cocoa-tree contains, in lieu of pith, a quire of paper of fifty or ſixty ſheets, on which people may write. This is like that which is found in the middle of a fruit of Peru, mentioned by M. Frezier, author of a voyage to the South-ſea. All this wonderful phænomenon, when reduced to its juſt value, is in my opinion, no more than that the pith of the palm-tree, and the pulp of that fruit, may be eaſily made into ſheets in the ſame manner as that of the Chineſe elder, which is made into thoſe fine artificial

artificial flowers that are brought from that country, or the books made of the roots of a kind of mallow, which requires no more than to be artfully dried, and cut in leaves. The *muſa* or banana-tree has been employed for the ſame or ſuch like purpoſes.

The claſs of the *liliaceous* includes the aloes, the *yucca:* from the aloes is obtained the thread of *pitte*, known by the uſe to which it is put. Father *du Tertre*, in his natural hiſtory of the Antilles, deſcribes the manner in which that thread is got. Sir Hans Sloane, in his catalogue of the plants of Jamaica, likewiſe mentions theſe aloes. In the number of ſynonimous names which he recites, ſome of them are taken from the uſe that is made of thoſe plants, and which I cannot help, for that reaſon, repeating in this place. The ſecond ſpecies of that author is by Gaſpar Bauhin, in his *Pinax*, p. 20. called the eleventh ſpecies of *papyrus*, employed for paper. Cluſius, in his treatiſe of exotic plants, p. 6. mentions a ball of thread made of the bark of a tree, which, according to Sloane, is this aloes. John Bauhin, tome I. p. 384, copies Cluſius, and ſays this thread is very fine and extremely white. The third ſpecies of aloes, according to Sloane, which nevertheleſs is a true ſpecies of *yucca*, is known in *Luet*, p. 645, under the name of an excellent kind of hemp or flax, which even approaches very near to the fineneſs of ſilk.

Seba,

Seba, in the firſt volume of his work, has given the figure of two leaves of a plant, which he calls the aquatic bullruſh of Surinam, compoſed of innumerable threads or filaments. This bullruſh, ſays that author, ought to be examined with regard to its utility.

It was from the *gramineous* claſs, as I have already ſaid, that they obtained materials for the firſt paper which deſerves that name. Michili, in his new genera of plants, has inſerted, in the number of ruſhes, the plant called by Gaſpard Bauhin, in his *Pinax*, p. 19. and in his theatre of plants, p. 333. *the paper of Syria or Sicily*. Is this the ſpecies formerly employed in Egypt? The figure and deſcription of it given by Proſper Alpinus, namely that of Veſlingius and the ancients, leave it doubtful whether this laſt plant be a ruſh or not. Proſper Alpinus ſays it is the paper called *beid* by the Egyptians. M. de Juſſieu, at whoſe houſe people will always find lights in all doubts that can occur upon theſe ſubjects, and who finds pleaſure in communicating inſtruction, hath ſhewn me an Egyptian plant that ſeems to be a true ruſh, and when compared with that of Michili, exhibits no differenee.

Dodo conſiders the flag as a plant proper for paper, and gives it the name of Papyrus. I have obſerved above, that Pere du Halde ſays the Chineſe made paper of ſtraw or the blade of rice. Bamboo is likewiſe employed in the ſame

ſame country as a kind of paper; and according to the ſame author, is the reed-tree of Gaſpar Bauhin, in his *Pinax*, p. 18.

The birch, which is of the claſs of cats-tail flowers, was one of the firſt trees upon the bark of which people wrote. As the word bark may be deemed equivocal, it will not be amiſs in this place to fix its ſignification. Are we to underſtand by this word *bark*, that part of trees which covers externally the trunk and branches? Or is not rather that interior layer, which ought to become woody, and is called *liber*? Without all doubt, it muſt be this inner covering which we are to underſtand by the bark of birch; it ſeems alſo that in this ſenſe it ought to be underſtood in thoſe authors who treat of the different kinds of paper uſed by different nations. Moſt of theſe writers ſay, it is the ſecond bark which is uſed. Others have only ſaid, that they uſed the bark; but the preparations which they deſcribe, plainly ſhew that it was this inner part which was employed. I ſhould deviate too much from the plan I propoſed to myſelf in this eſſay, to mention the methods of this preparation. Rumphius deſcribes two trees with cats-tail flowers, one of which he calls the *domeſticum gnemon*, and the other *gnemon campeſtre*. The inhabitants of Amboyna, according to that author, obtain a thread from the bark of the boughs, which they beat a little, and this thread is proper for making nets, which they boil in a certain infuſion, to make them ſtronger

and

and leſs apt to rot in the water. This ought the more carefully to be examined, as the knowlege derived from ſuch enquiry, may ſerve to bring to perfection the cordage of ſhips, as well as that of which the fiſhers make their nets.

Here we ought to recal the idea which M. de Reaumur has produced upon the ſubject of rotten wood, an idea ſo much the more happy as it furniſhes others upon abundance of ſubſtances eaſily got: the foreſts preſent but too many of them ſometimes. The ſhops of our carpenters ſupply us with cuttings which, by their thinneſs are in a condition to undergo, in a little time, the neceſſary degree of rottenneſs; for here, as in every other thing, there is a proper degree which muſt be laid hold on. When the wood is too rotten, its fibres are too much divided, they have loſt that binding which connects their parts, they become too earthy, and I believe it would then be difficult, not to ſay impoſſible, to bind them together: therefore, the waſps do not uſe indifferently all ſorts of rotten wood, but know how to diſtinguiſh that which is proper for their purpoſe.

The nettle, the mulberry and the hemp are ranked in a claſs which is called *incompleat*, becauſe theſe plants want the flower, or the *calix* or the *petalæ*, or both theſe parts.

Kempfer, in his catalogue of the plants of Japan, mentions one which in the Japoneſe idiom is called white

white hemp, and to which that author has given the appellation of the great common nettle, which bears real flowers, and yields ſtrong thread proper for linen and other works. The ſame author calls the mulberry which is employed for paper, the Papyrus, whoſe fruit reſembles that of the mulberry, and whoſe bark is made into paper. Seba has given it the name of the mulberry-tree, which affords paper, and is cultivated at Japan. Pere du Halde ſays, tome 11. page 212. that before the mulberry branches, with whoſe leaves the Chineſe feed their ſilk-worms, are deſtined to the fire, ſome people ſtrip off the thin bark from theſe branches, and make of it a kind of paper, which is ſtrong enough to cover their ordinary umbrellas, eſpecially when it is oiled and coloured. I do not here join the other plant which the Japoneſe employ, becauſe Kempfer leaves it uncertain under what claſs it ought to be ranged. He calls it the Papyrus which lies upon the ground, yields milk, has plated leaves, and a bark proper for making paper. For the ſame reaſon I likewiſe mention here a tree which Sloane calls the tree with broad, long, jagged, ſmooth ſhining leaves, like thoſe of the laurel, whoſe interior rind may be extended into a fine cloth like muſlin for ruffles; this tree is commonly called *Lagetto*. Tome 11. tab. 168, 169. The people among whom this tree is found, make cloaths of it. It is needleſs to mention the uſe of hemp in making paper, every body knows we uſe it for that purpoſe; but hitherto no paper

has been made of hemp, until it had paſſed thro' the ſtate of rags. Yet Pere du Halde reports, that at Nangha, paper is made of hemp beaten and mixed with lime water, tome 4. page 373. And this confirms me in the notion I entertained, that the ſtalks, or what falls upon the form in dreſſing hemp or flax, might ſerve for the ſame purpoſe. I ſhall ſpeak of this below.

The *malvaceous* ſpecies diſpute the preference with all the other claſſes, for this kind of employment. All the kinds of the *mahot* yield a ſort of thread proper for cordage. Sloane mentions two mallows, one of which he names the mallow-tree on the ſea-ſhore, with round, ſmall, prickly leaves, white below, which bears a yellow flower, and a bark that may be made into thread. Catalogue of the Jamaica plants, page 95. This is one of the *mahots* of father du Tertre. The other is mentioned by the name of the mallow-tree with round leaves, a very large flower of a fine red colour, like the flower de lys, and a bark which yields thread. Ibid. This is another of du Tertre's *mahots*. It would be unneceſſary to mention the different kinds of cotton which are uſed in making paper. I have obſerved above, that cotton-paper was invented in the eaſt, and that in China, paper was made of cotton-rags; and indeed theſe are not neglected even in our manufactures. Although I have advanced, that people have never ſought after plants that were far removed

moved from thoſe claſſes which had been formerly uſed, I think I ought to except the flax, the linden-tree, and the thiſtle.

Linen rags have entered and now enter into the compoſition of paper: The workmen, in picking the rags, reject only thoſe which are produced from woollen ſtuffs and hides of animals: they pretend that theſe ſtuffs cannot be beaten; but this they ſay, perhaps, becauſe they are beaten with more difficulty than thoſe produced from the fibres of plants, the parts of which are more eaſily divided. They do not reject the others in thoſe paper-works where coarſe grey paper is made; the buſineſs then is to have a very fine paſte, and the hair may be beaten ſufficiently, to incorporate with the fibres of other rags, although they may not be ſo well bruiſed.

Veſlingius, in his little treatiſe upon the utility of cultivating plants, pretends that the down of certain thiſtles has been uſed in making ſtuffs: *ex acantii lanugine demptis ſpinis, veſtes effecerunt*, ſays that author. By the word *acantium* we muſt underſtand a kind of thiſtle. The ancients often employed the word in this ſignification. The linden-tree was and is uſed in making ropes, a circumſtance that denotes a flexibility in the fibres of that tree, capable of undergoing the neceſſary preparation for making paper.

What Veſſingius, whom I have mentioned, has writ concerning the *luffa arabum*, which may be conſidered as a kind of cucumber, ought to induce us to examine ſeveral plants. He ſays, that the inſide of the fruit, when the ſeeds are taken out, is no other than a little net which ſeems to be made of flax; whence he conjectures it would yield a thread like that which the Ethiopians and Indians, according to Theophraſtus, made of their cotton-apples, and the Arabians, according to Pliny, of their gourds.

I know no author but Seba who has ſuſpected that paper might be made of ſea-plants, and *alga marina*. When I read that part, I recollected that I had been ſtruck with the whiteneſs which it will aſſume, bleached no doubt by the ſpray of the ſea-water, by the rains and dews, and loſing that glew with which all the marine plants are covered. Upon the ſea-coaſts the *fucus* is uſed for dunging the vines and circumjacent lands; and I have obſerved that this, when tranſported to the grounds, likewiſe acquires a certain degree of whiteneſs, and, like the *alga*, preſerves its figure, together with a ſtrong conſiſtence: nothing is ſo common on the ſea-ſhore as the *fucus*, which in ſome places covers the coaſt, and nothing can be more eaſily collected.

There is another plant which is likewiſe found on the ſea-ſhore, but more commonly in ponds, and

and the baſins of gardens; it is the *conferva* of Pliny, and in ſome authors bears a name that ſeems to promiſe conſiderable utility. Imperatus calls it the ſea-flax. Loeſel, in his catalogue of the plants in Pruſſia, gives it the name of aquatic moſs, compoſed of very fine ſilky filaments. I can ſcarce doubt that ſome people have attempted to ſpin this plant. When it is wet, it has a flexibility that deceives people, and the great quantity of it found in thoſe places that favour its multiplication, and by which means the fibres are interwoven in ſuch a manner as to produce a kind of ſtuff like coarſe camblet, muſt have more than once induced people to try to make the plant uſeful in the arts. I know that a great princeſs, ſtruck with the quantity and fineneſs of this plant, was deſirous of having it ſpun; but it becomes too brittle when out of the water, to be ſuſceptible of this operation. I ſhall, in the ſequel, relate the ſucceſs I had in treating it, with a view to the paper manufacture.

I thought it neceſſary to enter into a circumſtantial detail of the plants which have been uſed in the compoſition of paper, and thoſe which may be uſed for that purpoſe, in order to give, as I before obſerved, a botanical hiſtory of that manufacture, and explain the plan of the work which I have laid down: and by the different claſſes which I have deſcribed, the public ſees the plants of our country which relate to it. At the ſame time it muſt be owned, that ſome of theſe claſſes

are not ſo rich here as in foreign countries. We are altogether ſtrangers to the claſs of the *palmiferi*; but, by way of recompence, the gramineous claſs is in greater abundance. The courſe of ſome rivers is retarded by a kind of foreſt of reeds, ruſhes and flags; and in ſome places nothing is ſo common as mallows: there is ſcarce a perſon among us, who is not ſometimes incommoded by the quantity of nettles and thiſtles. Cotton is nothing but a kind of down that ſurrounds the grain of that plant. I have therefore included in my project, the down of different plants, ſuch as that of willows and *linagroſtis*. The grounds planted with willows, are covered at one ſeaſon with the fall of the cats-tails of theſe trees; and ſome meadows, eſpecially thoſe that are barren, are full of the *linagroſtis*.

The ſtalks of hemp and flax are compoſed of two parts, the filamentous and that which partakes of the nature of pith. We cannot poſſibly doubt the utility of the firſt, which indeed compoſes our paper. Nevertheleſs, this thread is rejected as uſeleſs. It would therefore be a great advantage to render that part uſeful, even though the other never could ſerve any purpoſe. What prodigious quantities of materials would be acquired by theſe means! We know how much hemp is brought from Berry and Champaign. In the rope-works, and eſpecially thoſe of the arſenals belonging to our ſea-ports, great reſources would be found; they are now made into tow, which often amounts to

to ſuch a quantity, that they are obliged to throw it away, or make uſe of it as dung for the beds in their garden; in all the lower Poictiers there is ſcarce a peaſant who does not reſerve a piece of ground for flax ſeed.

It is not therefore for want of materials that we do not endeavour to procure a paper which may vie in beauty with our white paper, or at leaſt furniſh us with a kind proper for covers and bundles. Perhaps I may be thought to have found too many plants ſuſceptible of this operation, and ſeem inclined to transform every thing into paper. Although what I have related of foreign plants may be a prejudice ſtrong enough to inſpire a notion of the utility we may reap from our own plants, I know at the ſame time, we may be impoſed upon by analogy, which is always deceitful. In other reſpects, the experiments which I have made, although far from that perfection to which I wiſh we could attain, give reaſon to hope that one day we may acquire a certain degree of that perfection. Thinking I ought firſt of all to examine the ſtalks of hemp as the moſt common materials, and thoſe from which I thought I had reaſon to expect ſome ſucceſs, I cauſed them to be ſteeped in water for a certain time, that they might acquire a degree of rottenneſs which would facilitate their trituration. When they were ſuppoſed to be ſufficiently rotten they were beaten; but by a miſtake, which by the by, I had endeavoured to avoid, theſe ſtalks were beaten

with mallows and nettles, which I had ordered to be gathered and left to rot in a ſeparate place. Yet theſe different ſubſtances incorporated together: though it muſt be confeſſed, that their connexion was not very ſtrong, but, on the contrary, produced a very imperfect tiſſue. I look upon this eſſay, as ſcarce deſerving to be recounted; yet it ſhews that the leaves of plants as well as the filaments may unite and incorporate; and that, if thoſe different parts had been beaten ſeparately, and a proper degree of trituration beſtowed upon each, ſo as to form a well binding paſte, ſomething better might have been produced. I will even venture to ſay, this doubtleſs would have been the caſe, having obſerved what happens in ponds and marſhes. Nature, more tranquil than art, frequently forms a very fine paper of plants that rot in thoſe watry places. I have found, in ſome of the pools of water of the foreſt of Dourdan, when they have been entirely dried up, maſſes of a ſubſtance that altogether reſembles paper. They were compoſed of ſeveral *laminæ* or leaves, eaſily ſeparated from one another. They tore like paper, and though I could not then determine whether they were formed of rotten leaves, or only a kind of *byſſus*, it ſeemed to me, that if any of this laſt plant entered its compoſition, there was likewiſe in it part of leaves, trees and other plants. I have not fulfilled the aim which this obſervation inſpired me with; diverted by a variety of other occupations, I could not beſtow upon this work, the time, attention and neceſſary

preciſion

preciſion it required. It was more eaſy for me to repeat the experiment upon hemp alone. I therefore put in water to rot, ſome very fine hemp well cleaned from the parenchymatous part or pith that falls from the inſtrument in dreſſing it. The paper which it produced, was very ſtrong, and convinced me that it was very eaſy to make it of that part of the hemp which is thrown away in rope-works or other work-houſes, where it is dreſſed, or employed.

The conviction I reaped from this experiment, touching the hemp, neceſſarily influenced my notions concerning cotton, that down, much ſofter and more flexible than hemp, muſt eaſily undergo the neceſſary preparation for making paper. I ought indeed to regard the experiment I made upon cotton as ſuperfluous, after that which I had tried upon hemp; yet as authors, thoſe at leaſt whom I have read, do not ſay that cotton-paper was made immediately of cotton before it had paſſed through the ſtate of cloth; and Pere du Halde reports that the Chineſe make theirs with cotton-rags, I thought proper to remove that doubt intirely; becauſe it ſeemed to me eſſential that no ſcruple ſhould remain with regard to that fact; and the ſucceſs ſeemed to influence all thoſe parts of plants to which we commonly give the name of down. Of this kind there are ſeveral, namely the *linagoſtris*, the cats-tail of the willow, dogs-bane, and trumpet-wood, which, though not ſo eaſily ſpun as cotton, ſeem to me ſuſceptible of

that

that conſiſtence which is neceſſary to the paſte or pulp of which paper is made. The cotton being therefore beaten to a ſufficient degree, produced a ſmooth, white paper of a ſtrong texture, which promiſed to have all the advantages of our own.

I will not however pretend to propoſe it as an advantage, to make paper of cotton. The hemp-rag is a material in our poſſeſſion, which would be altogether uſeleſs if we did not know how to employ it for this purpoſe; but by knowing, from this and other experiments, that it is poſſible to make paper with thoſe different materials, even though they have not paſſed through an intermediate ſtate, we afford a *ſuccedaneum* to thoſe who are in want of ordinary rags, which are not ſo common as people may imagine, in countries remote from great cities. In ſome places of our American colonies, cotton is more common than hemp-rag, which may be the means of making that trade more lucrative and of greater conſequence; but perhaps this is giving views of utility which many other reaſons may render uſeleſs: beſides, to know whether or not it would be uſed to advantage, would require more delicate experiments, and a more minute enquiry touching the price which that paper would bring, and the profit which is acquired in the ordinary cotton trade. I have neither made the calculation nor the experiments that are requiſite; all that I am in ſearch of, is the poſſibility of the thing: and not its advantages or diſadvantages. I proceeded then to

to try the other downs, though I have been able only to examine that of the dogs-bane, called wad; and of the two kinds that are obtained from thiſtles, that only with ſeeds of divers kinds which are crowned, but not the kind which the ancients obtained from the leaves which have been mentioned above. This experiment did not ſucceed ſo well as that which I made with cotton. The paſte formed of the down of theſe plants, was not of ſuch a good conſiſtence or coherence, as that of the pulp made with cotton: yet, with much care and precaution it was formed into ſheets of paper ſtrong enough to be hung upon cords to dry, but very eaſily torn: the parts did not adhere, they not being ſufficiently interwoven and bound together; and without this quality no paper can be good. So great a difference between theſe kinds of down, may appear ſingular, but this difficulty will be explained by the following obſervation. That which is upon wad and thiſtle, is not properly ſpeaking a down: but formed of a ſort of hair ſuſtained upon the ſeeds of theſe plants. Theſe hairs are commonly called, by botaniſts, *tufts* and *plumes*, becauſe they form upon the ſeeds a kind of tuft, and many of them puſh out branches on the ſides, by which they reſemble real plumes, or feathers. Cotton, on the contrary, is a down that ſurrounds the grain, without order or regularity, ſticking cloſely to it, without any conſtant figure. When this is pulled off, and the ſeed wiped clean, we can eaſily perceive that it iſſues from ſmall points, like ſo many

many holes. If this operation is performed while the fruit is young, the threads or hairs are found ſofter and leſs dry than when it is farther advanced; and it is difficult to refuſe the notion, particular as it is, that cotton is no other than a matter which tranſpires from the ſeed. When we know what forms the down of certain thiſtles, which I have mentioned in the beginning of this eſſay, the ſingularity of the notion vaniſhes. The leaves and ſtalks of thiſtles are roughened with a quantity of hairs, which are ſo many pipes giving iſſue to a clear limpid liquor, a little viſcous and glutinous, which dries in the air, and aſſumes a conſiſtence like that of cotton: nay it really is ſo to ſuch a degree, that when this down is collected, it is eaſy to form a thread of it, between the fingers: ſuch an obſervation may perhaps appear very delicate to make, and thence doubtful and hazardous: yet it does not require ſo much attention as people may imagine; all that is neceſſary is, to procure a microſcope with a focus of ſome inches, to obſerve the threads and the kind of wheel in which they are formed: and both theſe being diſtinguiſhed, you may perceive, by the naked eye, all that paſſes in this operation of nature. That this may be ſeen the plainer, you may chuſe the *carduus benedictus* of the Pariſians, or that which has the round head covered with down. Theſe are, in my opinion., more proper than many others of the ſame claſs, for proving this obſervation. The interior part of the ſcales that form their head, is provided with an infinite number

number of glands that filtrate a liquor like that which I have mentioned; and this liquor changes in the air, to threads which form the down that ſurrounds the heads of thoſe thiſtles. This will not admit of a moment's doubt, ſeeing this thread may be perceived forming under the very eye: if we will gradually and cautiouſly ſeparate the ſcales from one another, we then have the pleaſure to ſee this matter lengthen and extend like a gum, roſin or wax, and in a moment change into white threads reſembling thoſe of paper.

Now we perceive the ſimilitude there is between cotton and the wool of thiſtles, and the difference between both and the pretended down of thoſe laſt, and of wad. The cotton iſſues from the ſeeds which it ſurrounds like the wool of thiſtle heads. And both ſweat from certain parts, which may be conſidered as a kind of glands. On the contrary, what is ſuppoſed to be down in the thiſtle, conſiſts of parts that are ſtiff and dry, conſequently brittle, eaſily grouped into little ſmooth maſſes, which are not compoſed of a quantity of ſmall fibres, that partly detaching themſelves from one another, form in the cotton and thiſtle-wool, that ſoftneſs and flexibility which makes what in theſe ſubſtances, is commonly called the cottoneous part: a quality which renders them eaſy to mix together, when they are beaten or pounded, in order to form the paſte for paper. Muſt we therefore entirely reject theſe downs? No, ſurely.

Perhaps,

Perhaps, in the twinkling of an eye, they may be rendered uſeful. I know it may be difficult to catch that point of view, than which nothing requires ſo much addreſs in improving the arts; but I ſhall endeavour, at the end of this eſſay, to give ſome hints on the ſubject; for it would be very advantageous to find the means of employing a kind of down which is in ſuch abundance, and coſts nothing but the trouble of gathering it.

I now proceed to another experiment, which, though unſucceſsful, ought to be related. It was tried upon the *alga marina*, which Seba exhorts us to examine. Under this name is comprehended not only that which is uſed in packing glaſs-ware, and wrapping round the bottles of *liqueur* which come from Montpelier, and from thence called the glaſs-makers weed; I ſay, not only this is regarded as an *alga*, but likewiſe the *fucus* or *varus*, which has a better title to the name; ſince the glaſs-makers weed is not properly of that ſpecies, but of the claſs of dogs-graſs. However, I have always mentioned it as an *alga*, becauſe it is better known by that than the name of *cyperus*. This plant, having been treated like the others I have mentioned, did not form a paſte that would cohere in any ſhape; for its leaves have but few fibres: they are in ſome ſort compoſed of *parenchymatous* parts, which may be conſidered as a bundle of ſmall veſicles, the ſphericity of which is an obſtacle to that union which muſt obtain among the parts of paper. Two ſpheres can only touch one

one another in one point; this is a truth demonſtrated in geometry, as well as this other, that plain ſurfaces may be in contact through their whole ſurfaces; a property which facilitates the intertexture of the parts of cotton and hemp in the compoſition of paper, and to which the other is an obſtacle. To this I likewiſe attributed the little ſucceſs I had in an experiment which I made with *corralloids*, a kind of plant of the claſs of *alga*, which abounds in all our woods, and in ſome places almoſt intirely covers the trees and rocks. Theſe plants are in ſome meaſure diſſolved by the trituration; and when they were ſpread in water, according to the practice of making ſheets of paper, they could not be re-united upon the form. The ſame thing happened to the *conferva* of Pliny, which is alſo of the ſame tribe.

It may be conſidered as a loſs to the paper manufacture, that we cannot give a body to theſe plants when they are triturated. The whiteneſs they acquire when drying, and their prodigious quantity, make us regret this circumſtance, eſpecially if they cannot be employed with ſucceſs in ſome other manufacture; and I can eaſily conceive what impreſſions the report of the commiſſioners of the academy muſt have made upon the minds of thoſe who conſulted it about the advantage that might be reaped from a cottoneous matter they had gathered in the pond of Petz, at the diſtance of a league and an half from Metz, and was found to be no other than dried

conferva,

conferva, which did not deſerve the attention that had been beſtowed upon it; for they had already founded great hopes on the diſcovery relating to the trade of the country.

A ſubſtance that might, perhaps, turn out to more advantage, is the cods of common caterpillars, which, in ſome years, are in ſuch plenty as almoſt to cover the trees. Theſe cods, though not proper for ſpinning, may, nevertheleſs, enter into the compoſition of paper. The eſſay which was made, gives room to hope for the ſucceſs. In effect, theſe cods, cleared of the leaves that ſtuck to them, being beaten, were eaſily reduced to a kind of pulp, which being ſpread in the water, was without difficulty collected on the form, and made into ſheets of paper that might be brought to a degree of perfection, which it muſt be owned they had not: nevertheleſs, though this paper ought rather to be ranked with the coarſe brown, than with the white fine ſort, it gives room to believe, that it may in time acquire a certain degree of whiteneſs. Some of the ſheets were whiter than others: nay the ſame ſheet was ſometimes whiter in one part than another: and the buſineſs will be to find a remedy for this inconvenience. One of the beſt (which, by the bye, I could not employ) is, without contradiction, to pound the cods in the ordinary mortars of the mills, or bray them under the cylinder. The quantity of cods gathered by my direction, was not enough to fill the mill-mortar; ſo that the workman

workman made uſe of an ordinary mortar, which was attended with two defects. The ſubſtance was not beaten uniformly, and the foreign bodies were not diſcharged. Theſe evils are prevented in the mill. The peſtles are always moved equally, or at leaſt more equally than with the hand of a workman who uſes an ordinary mortar; ſo that the ſubſtance muſt be more effectually triturated in the mill. Beſides, the mortars of this machine are open on one ſide, near the bottom: this hole is covered with a hair-cloth, the interſtices of which are large enough to tranſmit what has undergone a ſufficient degree of trituration. Thus the paſte becomes whiter; an advantage we cannot obtain from an ordinary mortar, and which the ſilk-paper I made could not have: for, ſome of the ſheets were ſprinkled with ſeveral little black points, occaſioned by the excrement of the caterpillars, which were interwoven with the ſilk of the cods: and the water which paſſes into the mortar of the mill, would have carried off theſe excrements. Nay, perhaps the ſilk loſes a part that ſerves no purpoſe but to render the paper of a greyer colour when it continues mixed in the pulp. This part is more eaſily diſſolved and diſengaged from the paſte, by the water that continually runs through the mortars. The ſmall fragments of leaves that may be left after the picking will alſo be beaten with more difficulty in a common mortar; and the paper will be ſpoiled by them, as it happened to ſome ſheets of that which we made. This inconvenience

would be avoided by putting the cods in the mill-mortars, where at leaſt, the leaves would be more eaſily beaten, and this they might eaſily be, in the ſtate wherein they appear in the cods. For the caterpillars have diveſted them of their parenchymatous parts on which they feed: and nought remains but the fibres, which, by the network they form, ſupported the parenchyma that filled up the interſtices. Though theſe fibres be like thoſe of a tree, they are at the ſame time more ſlender and fine, and have already, by the work of the caterpillars, acquired an elaboration which wants only a little of our aſſiſtance. The beginning of rottenneſs might ſuffice. The preparation given to the rags before they are put under the peſtle, is one of the methods that may be the moſt uſeful on this occaſion. The rags being picked, are cut into ſmall pieces, and laid in heaps, where they grow warm, and acquire a kind of fermentation that gives them a degree of rottenneſs, which renders them the more fit for trituration. In the opinion of the workmen, this preparation is ſo indiſpenſibly neceſſary, that when the rags are clean, and deſtitute of the greaſe which is then requiſite, they think themſelves obliged to ſupply this defect. The ſame method may be taken with cods mixed with leaves. Theſe leaves, aſſiſted with a little moiſture, will heat and rot to a certain degree, which it is our buſineſs to diſtinguiſh, that then they may be beaten as eaſily as the ſilk.

It

It were to be wiſhed that theſe leaves were not mixed with the ſilk, whereas the greateſt part of the cods are compoſed of them. Yet there are ſome which conſiſt of pure ſilk; and are uſually found in the angle formed by the union of two branches. Theſe are no other than threads of ſilk ſtretched from one bough to another, in different ways. The others conſiſting partly of leaves, are placed in the middle of leaves, which after the caterpillars have partly conſumed, they bind and unite them together; thus forming larger or ſmaller bundles or pods of the ends of little branches. There is no room to doubt that the ſilk of other caterpillars might likewiſe be employed: the cods of pure ſilk, and even thoſe that are partly formed of the hair which covers the caterpillars, are equally proper materials for paper: nor ſhould the cods belonging to the caterpillars of the pine-tree, be rejected.

We ought, however, to be ſure that it is poſſible to make paper of ſilk: but is it made of that ſubſtance in China? Though it may appear unneceſſary to reſolve that queſtion, I will examine the reaſons that are advanced to prove that it is not made of ſilk. It is uſually ſaid, that if the Chineſe paper, which is pretended to be made of ſilk, was actually compoſed of that ſubſtance, it would in burning, twiſt itſelf different ways, and be ſhrivelled up like parchment, which is made

of prepared ſheep-ſkin; whereas that paper burns as equally as that made of the rags of hemp-cloth and linen. Theſe facts cannot be contradicted; but yet the ſilk-paper which I made, burned like ordinary paper, though the cods, which were the chief materials, ſhrunk up in burning, in the ſame manner as parchment. What, therefore, is the cauſe of this difference? I believe we muſt ſeek for the explanation in the tiſſue or texture, which is very different in the paper from what it was in the cod. There the threads are long, diſpoſed in different manners, ſo as that one ſingle thread often forms ſeveral folds. The fibres of paper are very ſhort, and though differently arranged and bound together, the connexion is not ſo ſtrong: it is no longer one or ſeveral threads of a conſiderable length. It happens then, that when the cods are burnt, their threads are drawn different ways; thoſe of one ſurface draw thoſe of another, and therefore, they muſt twiſt and turn ſometimes to one ſide and ſometimes to another. Whereas, the fibres of paper being ſo ſhort and connected together only by *juxta poſition*, they muſt act very little, if any thing at all upon one another, conſequently will burn equally. What proves the juſtneſs of this explication, is, that in paper there is ſometimes one place where the ſilk has not been well beaten, and is ſtill too much interwoven, and that place always is ſhrivelled up, in burning. This explanation is (I believe) ſufficient to clear up the queſtion relating to ſilk-paper; and howſoever the Chineſe paper may be made,

made, I think we ought to be perſuaded that it is poſſible to make it of ſilk. Neither ought we to entertain any doubt about the uſe to which we might put the ſtalks of hemp and flax; and I think we have reaſon to hope, that one day an advantageous uſe may be found, for the different kinds of down, not only of the cotton of which, it is perhaps very ſingular to have entertained any ſuſpicion, but alſo of the thiſtle, the trumpet-wood, and the wad, which more than any other would merit an happy ſucceſs, its paper having a gloſs and ſilver brilliancy, which might be of ſome uſe in many caſes. All that remains, therefore, in order to fulfil our hope of this down as well as of the others, is to find out ſome method, perhaps very eaſy and ſimple, and perhaps for that very reaſom the more difficult to invent. If, for example, when the materials are ready to be beaten, inſtead of ſimple water, we ſhould ſubſtitute a gummy or mucilaginous water like that in which have been boiled the parings of leather, roots of marſh-mallows, the great comfrey, or ſuch ſubſtances; the paſte by theſe means would be endued with a kind of glue, which might be an expedient by means of which the parts would cohere more ſtrongly; perhaps it would be ſufficient to prepare in this manner the water of the tub in which the paſte is diluted when it comes from under the peſtle. If notwithſtanding this preparation, the paſte ſhould not have body enough, perhaps by ſubſtituting compreſſion in the room of immerſion, which is the ordinary

method of forming the ſheets of paper, we ſhould be able to render the parts of the paſte more coherent; and I imagine this is the method which muſt be taken with that cottoneous ſubſtance that owes its origin to the *conferva* of Pliny. The heaps formed by the re-union of the different feet of this plant, are already of a certain thickneſs, and not eaſily torn; ſo that in extending the paſte made of this plant, we might give what thickneſs we would, to every ſheet, and the compreſſion would afterwards do the reſt. It might be found impracticable to make ſheets as thin as thoſe of ordinary paper: but even, if we could do no more than make paſteboard, it would be an advantage which we ought not to neglect; but on the contrary proſecute with care. Such examinations have always conſtituted my deſires, ſince I thought of making experiments upon paper. I have not been able hitherto, to accompliſh my ſcheme; but nevertheleſs, I have reaſon to hope I ſhall one day ſee it accompliſhed. I have the advantage of belonging to his ſerene highneſs the duke of Orleans, to whom I have the honour of explaining my notions, and who has permitted me to proſecute, under his eye, the experiments which I have projected, believing that they may be of ſome advantage to the public: an advantage which is the principal object of that great prince's thoughts, even in his amuſements.

An

An account of the hunting, œconomy, and trade of the Laplanders; as alſo of the ſtate of agriculture in the Swediſh colonies ſettled among that people. By Mr. de JUTERBOG.

IF neceſſity is the mother of thoſe arts tha tare moſt neceſſary, as opulence produces thoſe that are moſt frivolous, I imagine, that in order to learn the ſecrets of a prudent œconomy, we cannot chooſe better maſters than thoſe people to whom nature ſeems to have refuſed all the conveniencies of life. As the induſtry and frugality of theſe nations ſupply all their wants, and they are obliged to avail themſelves of thoſe things that are deſpiſed or neglected in wealthy countries, they may in ſome ſenſe be ſaid to owe more to themſelves than to nature, which with regard to them, ſeems to have been a little too unjuſt in the diſtribution of her benefits. Yet the œconomy of ſuch people is a very inſtructive ſchool even to thoſe nations who are moſt favoured by nature. In the moſt flouriſhing countries of the world, there are ſome diſtricts leſs happy than others, where the inhabitants may ſucceſsfully imitate thoſe nations which are in the ſame

ſituation. Beſides, ſome years occur, in which, through the intemperance of the air or other accidents fatal to fruit, the moſt fertile lands will bear nothing but barren heath, and then we may find reſources in the practice of people who have been inſtructed by continual neceſſity: ſuch are the Laplanders, a people otherwiſe little known among us. Lapland, which the nations call *Sameaedna* or *Sameladde*, is divided into Swediſh, Daniſh, and Ruſſian: its whole extent amounting to 480 leagues in length, and pretty near as much in breadth; but the number of its inhabitants is ſo ſmall, that the worſt inhabited province of France, contains more people than that vaſt northern country. It is not ſurpriſing that other nations ſhould have little temptation to ſend colonies to a country which is partly ſituated beyond the artic circle; and produces no ſort of food for the inhabitants, but fiſh and ſome wild beaſts; and whoſe deſerts never echo with the ſong of the lark or nightingale: where, inſtead of an agreeable variety of fruitful hills and laughing meadows, almoſt nothing is ſeen but mountains covered with eternal ſnow, and marſhes here and there producing a few willows, and ſmall birches that wither before they attain the growth which is natural to them in milder climates. Add to theſe reaſons, that in the northern parts of Lapland, night prevails during a certain ſeaſon, almoſt without intermiſſion; that although, after the month of March, their days begin to be longer than in countries ſituated on this ſide of the

the artic circle, the ſun has not force enough to produce an univerſal ſpring in theſe icy climes; for, there are ſome mountainous diſtricts where, even while the ſun appears ten hours above the horizon, the people croſs with carriages, lakes and rivers frozen to the bottom, which often are not thawed during a ſucceſſion of years; and finally, that in other diſtricts, the extremeſt heat of ſummer brings along with it different kinds of * gnats or inſects, every ſpecies of which is more inſupportable than another, and ſo prodigiouſly numerous, that ſometimes they veil the ſun, ſo as to cauſe the darkneſs of night at mid-day. But as it is well known that the fineſt countries which we ſee in the world, owed great part of their fertility and goodneſs to the induſtry of the nations that inhabit them; and it is plain that the ancient Germans, the Scythians, the firſt inhabitants of Thrace, and the Aborigenes of Italy, would not have left a barren and ungrateful country to their deſcendants, if they had preferred application and agriculture to idleneſs and rapine: the Swediſh

* Theſe are diſtinguiſhed into three ſpecies: the firſt, is in Swediſh, called *Mygor*, in the Lapland language *Tjueika*, and appears in the month of June. The ſecond, which is ſmaller than the firſt, begins likewiſe to appear in the month of June, being called *Knart*, by the Swedes, and *Muockir* by the Laplanders: the third called *Hya* by the Swedes, and *Mueiva* by the natives, is the ſmalleſt of the three, the moſt venomous and troubleſome to travellers and the people who work in the fields.

nation, to the dominion of which, the moſt conſiderable part of Lapland is ſubject, hath not yet loſt hopes of turning this great extent of country, to ſome account. There are means for draining the marſhes, and augmenting the good black mould; in ſome places grubbed by the Swedes, as well as in the lands adjoining to ſome perſonages, they have already ſown and reaped rye: yet this ſucceſs was deemed impoſſible when Scheffer publiſhed his deſcription of Lapland. This, it is to be hoped, will gradually excite the endeavours of the Laplanders, who are attached to their own country by a prejudice which in ſome ſort conſtitutes their happineſs: for they are fully convinced that in the whole univerſe they could not find a place of abode more ſecure and agreeable than their own. Beſides, though the greateſt part of Lapland is ſo ſtony that it ſeems incapable of any ſort of agriculture, there are ſome ſpots ſo covered with a ſoft fat mould, that the natives, when they tranſport their habitations to theſe places, are obliged to carry along with them ſtones for the conſtruction of their hearths. Scheffer is miſtaken, when he ſays that rain is leſs frequent here than in other climates; and that from this ſcarcity, the barrenneſs of the country proceeds. Nor is this occaſioned by the ſhort duration of the ſummer. For, when the heats begin, they are ſo powerful, that often in lakes which have been croſſed, with ſledges in the evening, there is not the leaſt veſtige of ice to be

ſeen

ſeen next day. By this ſudden change, the earth is dried and purified much ſooner than in other countries, and herbs, plants and leaves appear all at once, where but a few days before, the rudeſt winter reigned. Every thing ripens with the ſame diſpatch; and whereas in ſouthern provinces, the people are ſometimes obliged to wait for the harveſt four months after the corn is ſown, here the crop is gathered at the end of ſix, ſeven, eight or at moſt nine weeks after ſeed time. Now, if the natives would apply themſelves to the melioration of the ground, ſearch after the ſpots proper for agriculture, and find out (as ſome people would make us hope) a kind of corn that would agree with the climate; we might, according to all appearances, reap as plentiful crops in this as in any other country. Nay, perhaps there is no occaſion to travel far for that kind of corn which is wanted: who knows but ſome plant, a native of the country, and accuſtomed to the climate, may be ennobled by a careful cultivation? for, it is very certain that our greens and corn did not arrive at their preſent degree of perfection, without the care of mankind; and that they would ſoon degenerate, if by long neglect they were ſuffered to return to their original nature. But it will be more to the purpoſe, at firſt, to entertain our readers with what nature produces here of herſelf, without the aſſiſtance of human induſtry. The firſt thing that preſents itſelf is a vaſt extent of heath all covered with

moſs

moſs. Now, this moſs being the ordinary food of the rain-deer, which is almoſt the only kind of cattle of Lapland, theſe heaths muſt be of great ſervice. There are ſome places, eſpecially in the valleys, on the banks of rivers and lakes, which bear pines, fir, birch, juniper-tree, willows, alders, poplars, &c. ſo that in ſeveral diſtricts, the natives would be under no neceſſity of living expoſed to the air, as they are, and dying of cold, if they would make uſe of the wood which nature offers. There is likewiſe a great number of meadows, which produce graſs ſufficient for maintaining the cattle of the Swediſh colonies: ſometimes it has been been ſeen to grow at the very roots of mountains covered with ice; and it is very probable that the marſhy places by draining, might be changed into meadow or labourable ground. Lapland, moreover, produces ſeveral kinds of berries or apples (a round, ſoft fruit uſually covered with a ſmooth thin ſkin) which the inhabitants know how to uſe to advantage, though they are for the moſt part, unknown every where but in the northern countries: and has likewiſe its own particular flowers and plants, the enumeration of which may be ſeen in the work of M. Linnæus, entituled *Flora Lapponica*. Though here are no gardens planted by the hand of man, nature ſeems to have taken that charge upon herſelf: for at the feet of ſome mountains, we ſee trees ſo well diſtributed, that art could not invent a more agreeable diſpoſition. Beſides, the pine foreſts are

are more uſeful to the Laplanders, and inhabitants of the weſtern Bothnia, than the faireſt orchards are to more fertile provinces; for, from the bark of thoſe trees they are uſed to make bread, and this nouriſhment, bad as at firſt it may ſeem to be, maintains their bodies in full vigour. Here we ſee mountains of prodigious height and terrible aſpect; but, as they ſeem to have been raiſed as buttreſſes to reſiſt the fury of the winds which prevail in that country with ſuch violence as would re-plunge nature in her original chaos, they are to be regarded as benefits. As for the tradition importing that the clouds ſometimes whirl aloft men and rain-deer from theſe heights, it is no other than a fable; but Linnæus deſcribes circumſtantially, the profound darkneſs which ſometimes ſuddenly invelops the tops of theſe mountains. Thoſe who are acquainted with Lapland, contradict the common opinion, that pretends there are no practicable roads even in ſummer, and that it is impoſſible to croſs the country in that ſeaſon: they affirm, on the contrary, that the mountains always leave between them, ſpaces large and convenient enough for the paſſage of travellers. But, certain it is, that in long journies, they are obliged to carry along with them ſmall boats for croſſing the lakes and rivers. The Swedes boaſt much of the admirable proſpects that are here produced from the contraſt of mountains wholly whitened with ſnow and ice, hills covered with moſs, lakes full of iſlands, ſerpentine rivers, caſcades,

flat

flat country and woods: but we have reaſon to obſerve with M. Maupertuis, that ſome of thoſe countries would be too beautiful, if they were not ſituated in Lapland. The authors of that nation, ſpeak of certain things with extravagant exaggerations. Olaus Rudbek, for example, goes ſo far as to ſay, that he has ſeen diſtricts in Lapland, which he could very eaſily believe might have been the terreſtrial paradiſe.

With regard to metals contained in the earth, there is found at Skangliware, in the March of Torno, a mineral which is a mixture of gold and ſilver; and at Keckſiaſware in the ſame March, another that contains lead mixed with ſilver. They work iron-mines at Gelliware, in the March of Lullo, and at Jonuſvando in the March of Torno, where there is likewiſe a foundery, as well as in ſome other parts. Copper is found in the mines of Swappaware, in the March of Torno, and in thoſe of Wordnacka, in the March of Lullo. Silver is extracted from the mines of Naſafiael, in the March of Pito, which is purified in the foundery of Silbojock, and from thoſe of Kindeware, in the March of Lullo which is ſmelted in the foundery of Quickjock. We ſhall ſay nothing of the marks of mines that are found at Ananas, Jerta, Ortaſoiwe, &c. ſituated in the March of Lullo. The treaſures of theſe parts are not yet diſcovered, becauſe of the bad direction of the Laplanders, who had procured the firſt pieces of ore. We likewiſe ſee, in the Mineralogy of

of Bromell, that there is no ſcarcity in Lapland, of very large and beautiful foſſil chryſtals; and Scheffer gives us to underſtand, that heretofore the natives uſed them as flints to their fuſils. Here likewiſe are found amethyſts of a purple colour, topazes, loadſtones, quickſilver and cinnabar; but in all likelihood theſe things are not in great plenty. But we will add, that in certain places, are found ſome marks of mineral-waters.

Let us now proceed to the different kinds of animals which live in Lapland, barren as it appears: for this conſideration is that in which we are chiefly intereſted. In furs conſiſts the principal trade of the country, and this is almoſt the only commodity from which it draws money. The principal game in this and the neighbouring countries, is the elk. Some of theſe the natives take by a trap, called in the Swediſh language *lee*, conſiſting of a ſpring made of braſs-wire, which when the elk paſſes over it, flies up, and drives an iron ſtake into his body. They are likewiſe caught in a kind of pit like thoſe that are made for taking wolves. The fleſh of this animal is eaten either freſh or ſmoaked. In Jaemteland, a Swediſh province in the neighbourhood of Lapland, it is the cuſtom to carry a ſhoulder of every elk that is killed, to the miniſter of the pariſh. In certain diſtricts the bear as well as the elk, is taken in the *lee*: but is likewiſe killed by means of certain hand-guns, to which they fix a bait with a braſs-wire in ſuch a manner, that the guns fire, as ſoon

ſoon as the animal touches it: though the uſual method is to ſhoot them with a fuſil, when they approach thoſe baits. Nevertheleſs, this expedient is attended with ſome danger, and for a long time the inhabitants of countries infeſted by theſe powerful ſavages, have been adviſed to furniſh their fuſils with bayonets, that they may be in a condition to defend themſelves when the bears, after having been miſſed, come to attack them. The Laplanders have a particular ſong which they ſing after having killed a bear: they begin by thanking the vanquiſhed enemy, for his having been pleaſed to do them no miſchief, and expreſs their ſatisfaction at his arrival. Then they addreſs their thanks to the divinity which hath created beaſts for the uſe of man, and given him ſtrength and addreſs to overcome them. Moreover, it is ſaid, that in conſequence of a ſuperſtition univerſally received among the Laplanders, he who has had the good fortune to kill a bear, is forbid to lie with his wife, for three days after the exploit. Wolves are here in great number, and make terrible havock, eſpecially among the elks and rain-deer. The manner in which they take the firſt, is too ſingular to be ſuppreſſed. When the wolf having purſued the elk until he is quite tired, lies down to take ſome reſt, the elk repoſes himſelf alſo: but the firſt has no ſooner recovered his ſtrength, than he rouſes the other anew, which ſoon becomes his prey: for the nerves of that poor animal, grow ſtiff during his halt; ſo that flying with great difficulty,

ficulty, his death becomes inevitable. The wolf-pits which we uſe, are the ordinary and ſureſt means of catching theſe dangerous animals. It has been obſerved, that when a wolf-hole is deſtroyed, the old ones betake themſelves to flight at firſt, but return when they hear the diſtreſs and cries of their little ones, and that is the moſt convenient time for ſhooting them. This method of making the whelps cry, deſerves our imitation. The glutton is pretty common in this country; but Scheffer is miſtaken when he ſays it can live in the water like an otter: for it always remains upon the land. This animal is ſo aſtoniſhingly voracious, that one is almoſt tempted to believe it diſcharges its food juſt as it was ſwallowed: and the ſtench of the creature is inſupportable. In Lapland are found ſeveral kinds of foxes, white, red, black, &c. Here the beaver builds its habitation as in Canada. Their houſes conſiſt of four ſtories, and though they are made with ſtones that men would be at a loſs to put to any ſort of uſe, they are ſo well vaulted above, and built ſo firm, that they will laſt an hundred years. As the water riſes, the beaver aſcends from one ſtory to another, ſo as that he is always level with the ſurface: but although the addreſs of theſe animals is altogether ſurpriſing, it cannot ſecure them from that of mankind. Ermines and ſquirrels are taken in ſome diſtricts of the north, by a very ſimple kind of mouſe-trap. It is reported that the Laplanders, for fear of piercing the ſkin of theſe animals, ſhoot them

with blunt arrows, and are ſo dextrous as to hit them always on the head. If we add to the number of animals which we have mentioned, the wild rain-deer, hares, otters, and ſables, which are likewiſe common enough, it muſt be owned that the trade they carry on with their furs, ſome of which are very dear, becomes an object of great importance. The beſt reſource of the Lapſanders, next to their tame rain-deer and hunting, is that which they find in their lakes and rivers, which are very numerous. The chief lakes are, the great Uma, the great Windel, the Horeavan, the Storawan, the great Lula, the lakes of Kartom, Kali, Torno, Enara and Kimi. Some of theſe extend ſixty leagues in length, and contain a great number of iſlands. Scheffer reports that in Storawan, there are as many iſlands as days in the year, and that the lake of Enara forms a kind of archipelago, which contains iſlands ſo large, that no Laplander has lived long enough to viſit all the different parts of them. The principal rivers, great and ſmall, which croſs the different marches on every ſide, are called Angermann, Uma or *Imaus*, Skellefta, Pito, or *Pajeto*, or *Guerra*, Lula or *Leulius*, Kalis or *Gallus*, Torno or *Taranus* or *Taruntus*, and Kimi. In theſe lakes and rivers are found ſalmon, pike, tench, perch, ſmelts, red-eyed blays, breames, loaches, and ſome other ſorts of fiſh, in ſuch plenty that a great number of the Laplanders, and Swedes who are ſettled among them, not only ſupply themſelves

themſelves with enough for their own conſumption during the whole year, but likewiſe with a great quantity beſides, which they ſell to ſtrangers. Over and above the fiſh we have mentioned, ſome rivers in Lapland yield pearls: and the Swedes, ever jealous of the productions of countries ſubject to their dominion, pretend they are the faireſt in the univerſe. The birds that live in ſome provinces of Lapland, are either natives of the country, and remain always there, or fowls of paſſage that ſtay only part of the year. Of the firſt kind are heath-cocks, woodcocks, hawks, &c. and among the laſt, the moſt remarkable are ſwans, wild-geeſe, and wild-ducks. Thoſe great flights of ſwans and wild-geeſe, which we ſee croſſing the ſouthern countries, in ſpring and autumn, are either going to Lapland, or returning from it. In the ſpring, they chooſe their abode in the countries which the Laplanders have quitted, for reaſons that ſhall be explained in the ſequel, in order to repair to the coaſt of the weſtern-ſea; and before this wandering people returns in the autumn, theſe birds are gone, as if nature had ordained that thoſe diſtricts ſhould be inhabited alternately by rational and irrational creatures, ſo as that they ſhould never be altogether deſerted. Beſides, it is here obſerved, that ſome kinds of fowl, as well as other animals, love to make their abode in the neighbourhood of new colonies, where they are much more numerous than in other parts of the country; whether it is,

that nature has given them inſtinct to approach thoſe for whoſe maintenance they ſeem to have been deſtined, or, (which is more probable) that they go thither to feed upon the labours of man. Upon the coaſt of the Icy-ſea, or Mare-Glaciale, the fowl is more ſcarce than in the ſouthern provinces; but then thoſe countries breed more beavers, wild rain-deer, and other land animals. The deſcription which we have given of Lapland, plainly ſhews it has in effect real advantages, which may in ſome ſhape alleviate the inconveniencies to which the inhabitants are expoſed: nay, we may affirm that theſe inconveniencies are not ſo rigorous as they appear to be from the ſimple recital. The gnats, which we have mentioned, do not conſtitute an inevitable evil: it is obſerved that they uſually make their abode in woods, and that they are much leſs troubleſome upon the mountains, and in the beſt cultivated ſpots; ſo that they ſeem to be nothing more than the puniſhment of idleneſs. The continual light of the ſummer, attones for the darkneſs that prevails during part of winter; and yet this darkneſs is not total; for the ſnow, together with the moon and ſtars, afford light enough for tranſacting the moſt neceſſary affairs. Beſides, the Aurora Borealis, which is more frequent and bright in this than in ſouthern countries, often ſupplies the want of day; and in certain ſeaſons, the natives avail themſelves of the twilight, which begins four or five hours before the riſing, and continues as long after the ſetting of the ſun.

Moreover,

Moreover, it will be ſufficient to obſerve in general, that the Laplanders, as well as other nations that live on both ſides of the torrid-zone, have the greateſt ſhare of light at thoſe times when it is moſt required. The winters indeed are here extremely rude; but in order to ſecure themſelves from their violence, are not the inhabitants on the ſpot, where they can provide themſelves with furs? No body dies of cold, except ſome perſon, perhaps, who is bewildered in the woods, or who being fatigued with hunger or long journies, has not ſtrength enough left to return to his own home. The prodigious quantity of ſnow that yearly falls, inſtead of being a burthen to the natives, forms the fineſt roads in the world, for their ſledges: and the Laplanders have contrived a kind of apparatus for their legs and feet, by means of which they traverſe the ſnow with ſuch amazing ſwiftneſs, that they are able to overtake and knock down a wolf at full ſpeed. From hence, perhaps, the ancients have taken occaſion to forge thoſe fables of men, who ſurpaſſed the wild beaſts in running.

We ſhould, doubtleſs, exceed the bounds we have preſcribed to ourſelves, by repeating, what authors have ſaid touching the origin and hiſtory of this people. The Laplanders are not to learn that the world had a beginning, but their tradition adds, that God, before he produced the earth, conſulted with *Perkel*, which in their language ſignifies the evil-ſpirit, in order to determine how

every thing was to be ordained; that God propoſed the trees ſhould be of marrow, the lakes filled with milk, inſtead of water, and that all herbs, flowers and plants ſhould bear fruit; but that *Perkel* oppoſed this ſcheme, ſo that God did not make things ſo good as he intended they ſhould be. They have ſome knowlege of a general deluge; and the tradition ſays, that all the earth was inhabited, before God deſtroyed it; but in conſequence of its being turned topſy-turvy, the water ruſhed out of the lakes and rivers, overſpread the face of the earth, and ſwallowed up the whole human race, except a brother, and a ſiſter, whom God took under his arms, and carried to the top of a great mountain called *Paſſeware*; that the danger of the inundation being paſt, theſe two ſeparated, in order to ſearch if there was any other remainder of people upon the earth; but after a journey of three years they returned, and recognized one another for brother and ſiſter, upon which they parted again; that having known one another after this ſecond journey, they repeated the ſame expedient; but at the end of other three years, they met again, without knowing each other; then they lived together and procreated children, from whom are deſcended all the nations that now inhabit the earth. Their tradition concerning their origin is ludicrous enough. "The Laplanders and Swedes (ſay they) are deſcended from two brothers, who were very different in point of courage. A terrible tempeſt having aroſe one day, one of them was ſo frighted, that

that he crept for ſafety under a plank, which God through compaſſion, changed into an houſe, and from him are the Swedes deſcended: but the other being more courageous, braved the fury of the tempeſt, without ſeeking to hide himſelf, and he was the father of the Laplanders, who to this day live without houſes or ſhelter."

Although the Laplanders are univerſally reckoned the moſt cowardly people exiſting upon earth, their tradition mentions divers battles with the Ruſſians, whom they call Karul. And they relate, that the moſt conſiderable was fought in the march of *Kaitom*. To a ſmall number of ſuch traditional accounts is their knowlege of their own hiſtory and that of the world, reduced.

We have alſo obſerved, that the Laplanders are not the only inhabitants of this country. The Swedes and Finlanders have, within theſe eighty years, made ſeveral ſettlements in it; but, notwithſtanding the privileges which have been granted to them, they have not met with much ſucceſs, becauſe the ſettlers ruin themſelves at firſt by expenſive experiments which they are obliged to make, in order to know the nature of the ſoil, and the beſt manner of turning it to advantage: and indeed in all appearance, they cannot expect great ſucceſs until the government ſhall defray the expence of the firſt cultivation. Yet, weak as theſe colonies are, the Laplanders can never accuſtom themſelves to look upon them

them with a favourable eye. In effect, theſe new comers, by cutting down the foreſts, and often, through negligence or premeditated deſign, ſetting fire to the moſs, as alſo by deſtroying the wild rain-deer, partly deprive them of the means of ſubſiſting, and reduce them to the cruel alternative of either quitting the place or becoming their ſlaves. For, it rarely happens that a Laplander thinks of building an houſe, and engaging in agriculture: he never takes this reſolution until he has ſuſtained ſuch a loſs of his rain-deer, that he cannot poſſibly retrieve it; and frequently even in that caſe, he chooſes rather to gain his livelihood by fiſhing, or tending flocks, than ſubject himſelf to the labour of the ground.

As the greateſt wealth of the Laplanders conſiſts in their herds of rain-deer, nature, which diſpoſeth every thing with admirable ſagacity, hath given them a country abounding with moſs. It covers whole plains, and is, eſpecially in winter, the only food of the rain-deer; for in ſummer, theſe animals likewiſe eat leaves and graſs. Although this production of the earth ſeems reſerved for them, the people at Abo in Finland, and in ſome other places, have, during a ſcarcity of hay, endeavoured to make their cattle and ſheep eat of it. I ſhall, by the bye, deſcribe how it is managed, and I hope I ſhall be pardoned for this ſmall digreſſion, in favour of thoſe to whom it may be of ſervice.

The

The moſs is collected towards Michaelmas, and laid in great heaps in the open field, for, as it attracts a great deal of moiſture, and preſerves it a long time, it would rot in barns. They never take in more at a time, than will ſerve them for eight days; and after having cleaned it from the ſand which it may contain, it is waſhed in boiling water on the evening before it is to be given to the cattle. As the cows and ſheep do not eaſily accuſtom themſelves to ſuch food, a little ſalt or meal is thrown into the hot water with which it is moiſtened when preſented to them; by which means the taſte of the moſs is improved, and the appetite of thoſe animals excited. This is their food in the morning, and when they are watered, it is given to them by way of ſtraw or hay. This kind of nouriſhment has been obſerved to render their fleſh more juicy, and improve the quality of their dung; but it can be uſed only in the winter, for in the ſpring, the too great moiſture which it contains, would injure the health of the cattle.

But this is not the caſe with the rain-deer, for whoſe ſole benefit, as we have already obſerved, the moſs ſeems to grow in the country. Theſe animals are endowed with ſuch a ſure inſtinct, for knowing where it is, even under the ſnow, that when the Lapland herdſman perceives them browzing upon that which ſticks to the trees, without digging beneath the ſnow, he takes it

for granted that the ground in that diſtrict produces none, and drives his herd elſewhere to feed. The rain-deer are almoſt the only cattle of the Laplanders, require very little care, and anſwer almoſt all their occaſions. They eat very little, and are never houſed; in ſummer, when the natives travel, they carry their cloaths, proviſions, and utenſils; in winter they draw their ſledges with great ſpeed, in ſo much as to go eighteen or twenty of our leagues at one ſtage, without eating, drinking or halting. Were they puſhed, they would make ſtill more way, but then they would be fatigued. After their moſt ſevere journeys, they require no more food than as much moſs as a man can hold in both hands.

The fleſh of the rain-deer is the ordinary food of the Laplanders. They are cloathed with their ſkins from head to foot, and exchange the ſuperfluity for ſummer habits and tents, which ſerve them inſtead of houſes. They yield milk through the whole year, and this in ſummer, is dried in the ſtomachs and hides of theſe animals, and in autumn, it is frozen in ſmall caſks; the cheeſe which they make of it being a delicacy not only for them but alſo for their neighbours: but the blood and marrow of the rain-deer, are the moſt delicious diſhes of the natives; they make twine of their nerves, and offer up their horns to their idols; for notwithſtanding all the efforts which the Swedes have hitherto made, they have not been able to detach them from idolatry.

The

The mountaineer Laplanders poſſeſs the greateſt herds of rain-deer; ſome of them being owners of three thouſand. Theſe herds are apt to wander from the places where they are brought to feed: ſometimes they run away of themſelves, and ſometimes they are debauched and carried off by the wild rain-deer, which are continually traverſing the country. In winter, their keepers eaſily find them, by tracing their footſteps in the ſnow; but they find more difficulty in ſummer, becauſe in that ſeaſon their track is not eaſily diſtinguiſhed. Another care of the Laplanders, is to defend their rain-deer from the attacks of the wolves, which, when they fall upon one of their herds, will ſtrangle forty or fifty in one night.

It is ſometimes pretty difficult to rear the rain-deer, the ſucceſs depending upon the temperature of the air. When the ſnow that falls in autumn turns into ice, the year becomes very ſevere to them, becauſe they can no longer find the moſs under it, and unleſs that of the trees be in greater plenty, a great number of them periſhes. Beſides, all of them, great and ſmall, are ſubject to a diſtemper that ſometimes carries off a third part of the herd. As in France, the cattle and goats are attacked by the ſame diſorder, we imagine it will not be unuſeful to deſcribe it, together with the remedy which M. Friewald has publiſhed in the memoirs of the academy of Stockholm.

This

This diſtemper is, in the language of the country, called *Curbma*, conſiſting of large bumps formed upon the backs of the rain-deer, having in the middle an opening large enough to admit a gooſe-quill, if the bottom was not occupied by a black, tenſe-ſkin, which is the extremity of a grub, contained in the bump. This grub or chryſalis, white in every other part but juſt under the opening we have mentioned, is about the ſize of an acorn, and has the figure of an egg, ſurrounded with ſmall wreathed circles: it is produced by a fly reſembling the gadbee and drone, which is very common in Lapland; and of which Linnæus has given an anatomical deſcription in a memoir which is adopted by the academy of Stockholm. As this fly has no ſting, though ſome naturaliſts have given it one upon hearſay, it cannot dig a hole for its eggs in the hide of the rain-deer, but drops them on the backs of theſe animals, whoſe coat is always rough at the time when this inſect lays its eggs. An egg falling in this manner among the hair of a rain-deer, ſticks faſt like a nit, and being hatched in the ſequel, produces a ſmall worm which pierces the hide, and lodges itſelf between that and the fleſh of the animal. There it is metamorphoſed into a chryſalis, from which at length proceeds a fly, through the aperture of the bump. One would imagine that on the firſt attacks of the gnawing-worm, with which the rain-deer finds itſelf incommoded, it might free itſelf from ſuch

ſuch a dangerous gueſt, either by cruſhing or puſhing it off with its horn; but at that very ſeaſon, he has ſhed his old horns, and young ones bud out ſo tender and ſenſible, that nothing can touch them, without cauſing the ſevereſt pain. Nevertheleſs, nature which hath thus left the rain-deer without defence againſt this injury, hath given them inſtinct to foreſee and avoid it. As ſoon as he perceives this fatal fly approaching, he is ſeized with conſternation, betakes himſelf to flight, quits the plains, and gains the ſummits of the mountains covered with ſnow, from whence he dares not deſcend even to appeaſe the hunger that devours him. There he ſtands continually upon his guard, with his ears pricked up, and his eyes wide open, ſtamping with his feet, ſnorting, and inceſſantly ſhaking his tail and his whole body. Indeed all theſe precautions are no more than neceſſary to avoid thoſe formidable inſects, which having but two or three weeks to live, ſpend that whole time in queſt of the back of ſome rain-deer, where they may depoſite the fruit of their fecundity, and the hope of perpetuating the ſpecies. During this ſhort period of life, they take no nouriſhment, but are abſolutely in inceſſant motion, and in ſuch violent agitation, that ſometimes through meer fatigue, they fall as dead upon the ground.

In order to hinder theſe flies from letting their eggs fall among the hair of rain-deer, and the worms from piercing the ſkin of theſe animals,

M. Friewald

M. Friewald thinks the Laplanders ought to uſe for their cattle the ſame precaution they take to themſelves againſt the aſſaults of thoſe gnats we have mentioned in the former part of this memoir: namely, to rub their ſkin in every part that is not covered by their cloaths, with an oinment compoſed of tar, and the milk of the rain-deer. If, therefore, they would likewiſe anoint the bodies of the rain-deer, in all thoſe parts where the fly can depoſite its eggs, it is probable ſhe would cautiouſly avoid truſting them to ſuch a preposterous matrix; for every thing that is fat and oily becomes mortal to inſects, by obſtructing their pores. On this principle he concludes, that even if the egg ſhould fall among the hair and be hatched, the worm would never be able to lodge itſelf under the hide of the rain-deer, becauſe it could not proceed ſo far, till after having eaten the tar which covered it, and this it could not do without being poiſoned. For the ſame reaſon, he imagines, that if the Laplanders would pour ſome tar into the openings of the bumps, the conſequence would infallibly be this; either the chryſalis would die for want of air, or if the fly ſhould be formed, it would come before the natural time, the tar on one ſide defending it from the external air, and the heat of the rain-deer acting with greater force on the other, whence the fly eſcaping from the priſon ſo ſoon, would be ſurpriſed by the cold, under which it could not ſubſiſt; ſo that perhaps the whole ſpecies would be deſtroyed.

The

The rain-deer are not the only food of the Laplanders, the richeſt ſort, in the journies they make in ſummer, to the frontiers of Norway, purchaſe kine and ſheep which they do not kill until the ſnow begins to fall. They likewiſe go a-hunting, and the game which is moſt to their taſte, is the bear and the beaver. They uſually bake the whole bear, and divide it among thoſe who killed it. The bones are religiouſly gathered, and interred with two wooden ſpoons, a joiner's plane, a knife and ſome other utenſils; theſe people firmly believing that the bear will one day riſe and return, and have occaſion for all theſe things: for this reaſon they will not ſuffer a dog to carry away one of his bones, or if he ſhould ſteal one, he is immediately killed, and the loſs ſupplied by one of his own. The Laplanders alſo eat horſe-fleſh, either that which they kill, or that which they find dead; they in like manner accuſtom themſelves to the fleſh of dogs, foxes and wolves. Nevertheleſs, we muſt except thoſe among them, who employ themſelves in fiſhing, and do nothing in life, but paſs from one lake and one iſland to another, living entirely upon fiſh, which they dreſs in many different ſhapes, in ſome diſtricts, bruiſing, beating and mixing it with the powder of pine-bark, in order to make a kind of *bouillie*.

But, whether, the Laplanders live upon fleſh, or upon fiſh, cookery is among them, ſuch a noble office, that it is reſerved as a right belonging to the maſter of the family, who ſometimes,

however,

however, reſigns it to his ſervant. But the women never intermeddle in this domeſtic function: it is enough that they are allowed to take care of the children; they are not deemed pure enough to prepare food for the men, or to touch thoſe delicate meſſes which we have deſcribed.

The induſtry of the Laplanders, not only ſupplies their neceſſary wants, but even their magnificence. They make very commodious canoes, ſo light that a man can carry one upon his back: and their ſledges are intirely of their own manufacture, even thoſe that are adorned with all ſorts of figure in horn. Their neighbours buy of them little boxes, baſkets; and their ſnuff-boxes ornamented with different figures, are known and in requeſt through the whole north: but their maſterpieces are the magic drums which heretofore they commonly uſed, and ſtill uſe in private, for the purpoſes of divination. They make horn-ſpoons, and every man compoſes his own almanac, made of little bits of wood or horn, upon which are marked the days, weeks and months. Nor do they need any aſſiſtance in making their moulds, and melting their pewter-plate. The women are very dextrous in making pewter-wire, with which they adorn the girdles and garments of the men, as well as the harneſs of the rain-deer; they can dreſs all ſorts of ſkins, and ſhape them into all the different pieces of dreſs. Their cards and patterns are of their own fabric; and they make

make ropes of the roots of trees, and a very good, even thread of the ſinews of animals. Finally, they make very ſerviceable bows of ſtiff fir and pliant birch, which they join together and unite with a glue prepared in this manner. They flea a river-fiſh called *Perche*, and after having dried the ſkin, put it to ſoak in cold water, until the ſcales can be taken off: then they put four or five of theſe ſkins, in the bladder of a rain-deer, or in the bark of a birch tree, that the water may not wet them in the following operation, but that they may be penetrated by the vapour alone. Theſe ſkins being thus wrapped up, are boiled in water for the ſpace of half an hour or more, care being taken to ſink them with a ſtone to the bottom of the veſſel. When they have been boiled the due time, the bundle is taken out, and the ſkins are found reduced into real glue, ſo tenacious, that pieces of wood joined together by it, never ſeparate, provided the precaution has been taken to keep them together by rolling them round, with packthread, that the glue may have ſufficient time to dry.

From what we have ſaid of Lapland and its inhabitants, a judgment may be formed of the trade of that people, which in winter they carry on with the Swedes, and in ſummer, with the Norwegians. The Swediſh merchants repair to the places where the Laplanders aſſemble for divine ſervice, for trying their ſuits, or paying their tribute. There they buy rain-deer, ſkins of rain-

deer, fowls, fiſh, fleſh of rain-deer dried in the air, all ſorts of fur, cheeſe made of the milk of rain-deer, butter, baſkets, buſkins, ſhoes, gloves, and many other things of the Lapland manufacture. They ſell to the Laplanders, tobacco, meal, broad-cloth, hemp, kitchen-tackle of iron and copper, ſilver ſpoons, bracelets, girdles, rings, cups, hatchets, cutlery-ware, ox-hides, gun-powder, fuſils, lead, pins, brimſtone, pewter, wine, beer, figs, feathers, down and other ſuch commodities, a ſmall part of which theſe ſell again in their ſummer excurſions to the frontiers of Norway: but they do not in this ſeaſon, carry on ſuch an advantageous trade as in winter; for at that time the ſkins are not ſo good as during the froſt: ſo that they neither vend many furs, nor much dried fleſh, the merchandize of their country being almoſt reduced to bark-ropes and cheeſe made of the milk of rain-deer. On the contrary, they furniſh themſeves with felt, cows, ſheep, ſheepſkin, which the richer ſort cover with blue or red cloth, to ſerve them for mattreſſes, ſalt, tobacco, and eſpecially with aqua vitæ, which is prohibited in Sweden. While they were accounted ſorcerers, they got a great deal by ſelling to ſailors, magic knots, of ſuch virtue as to accommodate them with favourable winds, whitherſoever they were bound; but at preſent, the world being better informed on that ſubject, they find no buyers, and this fine branch of trade is abſolutely loſt.

The

The Laplanders for a long time, traded by way of barter, though now money is current among them; but they receive nothing from the Swedes, who give them that money, but Daniſh and Dutch crowns, becauſe they cannot carry any other into Norway. It is not very ſingular that their neighbours ſhould pretty well underſtand their language, or that there is upon the frontiers of Sweden, a neutral language, called the *language of the burghers*; but we ought to aſſure the reader, that the Lapland language is not ſo barbarous as many imagine, and that ſome people have written in it. Softer than that of Finland, and more regular than the Swediſh, it expreſſes things with great preciſion. For example, it has ſix or ſeven terms to ſignify the different kinds of roads, as many for the mountains, and about four and twenty to diſtinguiſh the rain-deer, according to their ſex, age, and properties. The moods of the verbs are more numerous than in any other language, and they have no fewer than thirteen different caſes for their nouns ſubſtantives.

MEMOIR concerning the cultivation of FLAX.

WE here preſent the public with a complete memoir touching the cultivation of flax, which will ſupply what our books of œconomy have not ſaid, confirm the good precepts they have given, and improve a great many others. It is written by an underſtanding man, who has lived long in Holland; and it is well known, that flax is a conſiderable branch of the trade of that country.

The Dutch are, without contradiction, the ſureſt guides we can follow on this ſubject. The difficulty is to draw from them the neceſſary inſtruction; for they are in general, jealous of their ſecrets, which are forbid to be diſcovered under ſevere penalties; above all things, they make a myſtery of their method of preparing flax. Very few people find means to penetrate into the places where it is managed; and theſe muſt not be in the leaſt ſuſpected of being drawn thither by any other motive than ſimple curioſity; but no foreign merchant or manufacturer is ever admitted.

The ſoil of every country is not fit for flax, which requires fat land: and too much care cannot

not be taken in chooſing that where we propoſe to ſow this plant: for upon this depends the quality of the grain, together with the number and ſtrength of the ſtalks. In ſome countries, however, they followed a quite contrary method, preferring a light and warm ſoil: true it is, the flax which this produces, yields a fairer, finer and ſofter thread; but the harveſt is indifferent, and in theſe meagre lands, the grain degenerates from the firſt or ſecond year. On the contrary, in fat ſoils that are a little moiſt, the flax bears excellent grain, and the ſtalks are very fine. The Dutch, whoſe flouriſhing trade evinces their dexterity in this particular, ſow very little flax in the province of Holland, becauſe the ſoil of it is poor; but in Zealand where the land is extremely fat and moiſt enough, they reap that which they employ in their manufactures. The linſeed which they rear in that province is ſold dearer, and much more eſteemed than that which is brought from the Baltic.

This aſſertion may ſeem contradictory to an inconteſtable fact, which is, that the Dutch themſelves yearly purchaſe the linſeed of Riga: but the ſolution of this ſeeming paradox, is very eaſy. The Dutch bring linſeed from Riga, only for the uſe of other countries; and this is not becauſe their own ſeed degenerates, but becauſe they have not a ſufficient quantity for the foreign demand.

 Although

Although I adviſe people to chooſe very fat land for their flax, I do not pretend to ſay that in theſe only flax ought to be ſown. I maintain nothing more than that they are the beſt, and that other lands are only endowed with degrees of goodneſs, in proportion to the qualities by which they approach the nature of thoſe fat lands. And indeed, although I have condemned the uſe of light ſoil, as it may be proper to have fine thread, I ſhall not at all oppoſe the practice of ſowing ſometimes weak ground with linſeed. There will even be an advantage in cultivating ſoils of a different nature. We ſhall have linſeed of our own growth, without being obliged to have recourſe to that which the Dutch bring us from Riga.

After having choſen a ſuitable piece of ground, we muſt give it the neceſſary preparation before it be ſown: and this is the method which is followed in Flanders and Zealand. To fatten the ground, the Dutch make uſe of dung, aſhes, and ſometimes human ordure: but this laſt ſort is only uſed in ſmall ſpots of ground which has long lain fallow. They, moreover, employ marl, lime, the cleanſings of pools, the raſping of horn; and upon the ſea coaſt, they gather for the ſame purpoſe, the ſea-weed, which forms a kind of glue upon the ſurface of the waves. Theſe different fatteners, which are preferred according to the difference of ſoil, are excellent for flax: being much

much better than dung: for, if this laſt is not ſufficiently old and rotten, it raiſes among the ſeed a ſort of weeds which grow in great number, and do infinite injury to the flax, in ſpite of all the care that can be taken to extirpate them. This inconvenience is not to be feared from the uſe of marl, lime, ſea-weed, and raſpings of horn; and this advantage certainly deſerves the entire conſideration of the farmer. Weeds, (and theſe I call paraſites, which grow contrary to the inclination of the farmer) weeds, I ſay, do abundance of miſchief to all ſorts of grain, but to flax in particular. For, they change its quality, and diminiſh its quantity.

With regard to the labouring part, in Zealand where the ground is fat, ſtrong and moiſt, two different methods are followed. The Zealanders plough the land thrice, four times, and even oftener, and leave it fallow during a whole ſummer; or elſe they begin by making it bear the ſeed, and in that caſe, this is their method of managing it. After having dunged and tilled it twice, they ſow the ſeed. The following year they plant it with madder, which remains upon it for the ſpace of two years, and in the fourth they ſow their flax. By theſe means they are ſure of having a moveable ſoil; for beſides the repetition of labouring beſtowed upon it, before the ſowing of the ſeed in the firſt year, beſides the fermentation of the dung, and the other labourings which are ſometimes repeated to the number

of five times, in order to prepare it for the madder, they are obliged to be continually at work upon it, in extirpating the roots of that plant.

Ground thus prepared, one would imagine ought to reward the cares of the farmer. Nevertheleſs, the Zealanders themſelves prefer the firſt method; when they want to have the moſt plentiful crop of linſeed. And indeed the abode of the madder in the earth, for the ſpace of two years, muſt greatly diminiſh the richneſs of the ſoil. The Zealanders follow this laſt method, for no other reaſon than the benefit which accrues to them from the madder: which benefit is ſuch, that the produce of their lands managed in the manner I have deſcribed for four years, being added, is more conſiderable, than if they had practiſed the firſt method.

In Flanders, where there is no trade for madder, and where the lands are extremely ſtrong, eſpecially in the neighbourhood of Courtray, the farmers do not ſow flax until after having let the ground lie fallow a whole ſummer and winter, and then laboured it ſeveral times ſucceſſively. In the drieſt and higheſt ſoils that will bear flax, as that round Antwerp, Ghent and Bruges, the people think it neceſſary to labour them three times, and never ſow the ſeed, until they have let them lie fallow for one ſummer at leaſt. When the ground is rendered ſufficiently moveable by theſe

theſe different labourings, the farmer's next care is to give it the laſt preparation for its receiving the ſeed. In Zealand it is diſpoſed into uniform beds ſeparated by ſmall ditches: the beds being from fifty to ſixty feet broad, and the ditches about two or three feet deep, and a foot and an half broad. This diſpoſition maintains a ſuitable degree of moiſture in the ground: the breadth and uniformity of the beds keep them in a condition to retain water, enough to ſecure them from drought; and the ditches ſunk at proper diſtances, diſcharge the ſuperfluity in time of exceſſive rains.

This method cannot be too much commended: a farmer by putting it in practice, need not be afraid of ſowing linſeed in a fat ground, though it is very moiſt; for the ditches will not only free the field of that water which might otherwiſe rot the ſeed, but will likewiſe, leave moiſture enough for the growth of the plant. The Flemings are ſo much perſuaded of the neceſſity there is for a certain degree of moiſture to the flax, that in their light and dry grounds they make no ditches at all: but uſually, make the ſurface of the field very even and uniform, that it may the longer retain the rain-water.

The ſoil being well prepared, we muſt chooſe the ſeed proper to be ſown; and ſurely, the farmer cannot be too careful in the choice. That which is ſhort, roundiſh, firm, oily, heavy, of a ſhining

a ſhining or clear brown colour, is accounted the beſt: and the peaſants of Zealand are very attentive in examining if all theſe different qualities unite in that which he is about to ſow. In order to aſcertain its firmneſs, he takes a large handful, and ſqueezing it until it pierces between his fingers and thumb, judges of its ſolidity by the quantity which is ſqueezed out by this compreſſion, and by the ſlow manner in which it comes out. To know whether it is heavy, he throws an handful into a glaſs of water: that which is good ſoon goes to the bottom; and he rejects that which ſwims on the ſurface. To prove its oilineſs, he throws ſome into the fire; and when it kindles and ſparkles as ſoon as it touches the coals, he makes no ſcruple in employing it. There is beſides, another method uſed in Zealand, which is to ſow ſome of the ſeed in little beds of earth; and in a little time, they ſee by the effect whether or not it is of the right kind.

All ſeed in general, ſoon degenerates, but particularly linſeed, let the ſoil in which it is produced, be never ſo ſtrong; for which reaſon it is proper to change the ſeed, and the more often the better. The moſt common rule followed on this occaſion, is to ſow in ſtrong ground, the ſeed which is gathered from a light ſoil, and to commit to a light ſoil what has been produced in a ſtrong one. This is certainly a very good rule, when properly underſtood: for if it is literally followed, we run the riſque of being miſtaken. Certain

Certain it is, light grounds yield ſeed of a very feeble quality, which cannot with any advantage be employed in the ſame kind of ſoil: and a farmer ought never to ſow lands of this nature but with a view to have fine flax: he will always be miſtaken when he expects good ſeed from it. The rule therefore needs explanation. And here it is:

Among fat lands, there are ſome which are more or leſs ſo, without loſing their title to that denomination. In order then to have always good ſeed, we muſt ſow in ſtrong ground, that which has been produced in ground of the ſame kind, though not quite ſo ſtrong. On the contrary, in ground that is ſtrong, we muſt ſow ſeed which hath been produced in ground which is ſtill ſtronger. The ſmalleſt difference in the nature of the ſoil is ſufficient to hinder the ſeed from degenerating.

By obſerving this rule we ſhall free ourſelves of the ſlavery to which we are now ſubject, in uſing the ſeed brought from Riga. The diſadvantage of receiving it from the hands of the Dutch, who ſupply us, is greater than may be imagined. Beſides, that we are not ſure they bring the beſt, we run the riſque of having that which will not agree with our lands: for, we buy it in the dark, without a poſſibility of knowing from what kind of ſoil it has been reaped. Conſequently we run the hazard of ſowing our fields with

with ſeed produced from the ſame kind of ground, in which caſe, we muſt neceſſarily have a very feeble crop: for lands, though ſituated at a great diſtance from one another, may be abſolutely of the ſame nature.

The quantity of ſeed ſown upon any field, has a great influence upon the crop. If we ſow a ſmaller quantity than the field is able to bear, the whole will profit by that deficiency; the ſtalks will be ſtrong, and the ſeed excellent. If the ſeed be ſown thicker, the flax will produce a finer thread; the harveſt will be more plenteous; but the ſeed will be of an inferior quality. This laſt method is practiſed by the Dutch, who are in no fear of a ſcarcity of ſeed. But it is the farmer's buſineſs to know the nature of his own ground; and he will be guided by his intereſt and experience. A ſtrong ground may bear a greater quantity of ſeed, without any detriment to the quality of the fruit which it ſhall produce. On the other hand, in a ground that is not quite ſo ſtrong, the ſame quantity of ſeed will riſe but indifferently, and produce very little advantage. The Dutch and Flemings employ about three or four buſhels per acre.

Linſeed muſt be ſown in mild, dry weather: and may be committed to the ground in the month of March, if the ſeaſon be favourable. Being thus early ſown, it will be ripe at the end of June, or in the beginning of July at

fartheſt; and the farmer will have leiſure to manage it in a proper manner. This expedition will alſo furniſh another advantage. After the harveſt of the flax, we may ſow turnips or other things of that nature, which will ſucceed to admiration, and uſefully occupy the ground, which would produce nothing during the remaining part of the year, if the ſeaſon had been more advanced when the flax was ready to be cut down.

I have ſeen ſome farmers in Holland and Flanders, ſow graſs ſome days after the linſeed had been committed to the ſame ground. This herb far from hurting, facilitates the growth of the other plant. In all probability, the young graſs ſecures the roots of the flax from the coolneſs of the rain, and at the ſame time ſhelters it from the heat of the ſun. I do not know whether this explanation of the alliance between theſe two plants, is juſt; but it is well known that flax and hay riſe very well together, and that, after having taken away the firſt, a very good crop of the laſt will remain.

There is very little to be ſaid upon the manner of ſowing linſeed. I ſhall only obſerve, that the ſower muſt follow the ridge in a direct line, throwing the ſeed with his right hand, and in returning uſe the left hand: for it is of great conſequence that the ſeed ſhould be equally ſcattered. Some days after, when it is time that the ſeed ſhould

be buried, they ſow the graſs-ſeed, if they chooſe they ſhould come up together. Both are covered by the harrow, and preſſed by the roller. As to the weeding, that operation begins, when the blade is two inches high, and continues until it is five: but it is dangerous to uſe the heel of the ſhoe in cruſhing the weeds, becauſe thereby the flax is ſometimes damaged.

Some farmers pluck it up before it hath arrived at maturity; pretending that the thread is fairer while the plant is green. But they are miſtaken, and loſe their ſeed without any indemnity; for the flax yields the fineſt thread, and that in the largeſt quantity, when the plant is ſeaſonably pulled: ſo that the farmer who anticipates the time of its maturity over and above his ſeed, loſes one half of the crop. The filaments of this flax, ſuffers great waſte in the different methods of dreſſing, and falls almoſt altogether in hards: for what reſiſts the pond, the ſowing preſs, and the hatchel, is of an inferior quality to that which would have been produced, had the flax been pulled when ripe.

The Flemings, whoſe experience may be depended upon, leave it growing as long as poſſible, on purpoſe to have a finer thread; and that they may have it as ripe as it can be, for their manufactures of linen or lace, they often run the riſque of loſing the ſeed, which eaſily eſcapes.

When

When the flax begins to be yellow, or rather to approach a citron colour, it is uſually time to reap it. But in order to be more certain of its maturity, they pull a few ſtalks, and take out the ſeed, which when firm and of a clear brown colour, the flax is ripe. The Dutch wait until the ſtalks are ready to open, and even until ſome of the ripeſt are actually ſo: but the beſt advice I can give upon this ſubject, is to delay the harveſt of flax as long as poſſible, without running too great a riſque of loſing the ſeed, which laſt, as well as the flax itſelf, is the better for this delay.

Some farmers have obſerved, that a kind of mildew falls upon flax that is ſown in light ground, about fifteen days before its maturity; and that this corroſive dew burns at firſt the ſeed, and after wards the ſtalk. If this obſervation be true, thoſe who cultivate flax in a light ground, ought to pay no regard to the cuſtom of others, who delay the harveſt until the flax be entirely ripe. In Holland, the flax being pulled, is laid ſoftly upon the ground in large handfuls, the head of the plant being always turned towards the ſouth; and ſeveral handfuls are put one over another, until the heap is a foot and an half high. Care muſt always be taken to lay the heads towards the ſouth: for the flax being thus diſpoſed, continues to receive from the ſun the degree of maturity it may want, and is ſecured from the rain, if any ſhould fall. But this diſpoſition is

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only obſerved when the weather is uncertain; for when it is dry, they content themſelves with ſpreading the flax by handfuls upon the field, that it may be the ſooner ready to be carried off. If the ſeaſon is favourable, twelve or fourteen days are ſufficient to make it perfectly dry: but when the weather is wet, they are ſometimes obliged to leave the flax in little heaps, for the ſpace of eighteen or twenty days. In countries expoſed to high winds, this method will not avail. There it is made into bottles that ſtand on end, expoſed to the ſun, in order to be aired and dried. In ſome places, the flax is bound and put up without being ſeeded, and in this manner it is kept 'till the month of December: by this management however, we run the riſque of loſing the ſeed. But in Holland and Flanders, it is ſhelled as ſoon as the flax is brought from the field. In theſe countries it is not the farmer who beſtows upon the plant the management neceſſary for its employment; for as ſoon as it is reaped, it is delivered to the workman, who dreſſes it accordingly.

Flax is eaſily lodged by the winds and rains, and as it ſometimes cannot be raiſed again, this accident ruins the hopes of the planter. In order to obviate this misfortune, ſome people divide the field in little ſquares of five feet; fix a forked ſtick at every angle, and when the flax begins to grow up, lay acroſs theſe ſticks, ſmall long poles,

poles, which ſerve as a ſupport to the plant: but this precaution is attended with expence. Others, inſtead of poles, uſe cords; but theſe do not ſo well anſwer the purpoſe. When care is taken not to waſte too much ſeed in ſowing, the ſtalks that riſe are ſtrong enough to ſupport themſelves; but then the flax does not yield ſuch a fine thread.

An eſſay upon the vegetation of ſtones. By Mr. LIEBEROTH, an officer in the mines of Saxony.

THERE is a viſible vegetation in the animal and vegetable reigns: and though it muſt be owned that this is not ſo conſiderable in the mineral, eſpecially in ſtones, which conſtitute a part of it, muſt we abſolutely deny them all ſort of growth or increaſe? Is it not univerſally agreed that all bodies are ſubject to change? And are not all poſſible changes in bodies, cognizable by our ſenſes, performed by motion? Vegetation is therefore effected in like manner; and if all bodies acquire augmentation, and undergo revolutions, why ſhould we exempt ſtones from the ſame fate? without all doubt they vegetate; new ones are formed in ſome places where they were never found before, while in others, they periſh or aſſume a new form, in ſpite of their extreme ſolidity. Every body knows the hardneſs and duration of ſtones; a great quantity of which, both upon the ſurface, and in the bowels of the earth, reſiſt the ſteel, and all human force, yielding to gunpowder alone, although their origin ſeems ſo ſlight and feeble. From hence we learn, that nature often employs the weakeſt materials in forming the moſt ſolid bodies. Indeed it ſeems

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aſtoniſhing that the enormous ſtones found in fields, rocks of immenſe extent, and even jewels, ſhould derive their origin from ſuch a thin and ſlender fluid as water; and yet in all probability, theſe maſſes, how hard ſoever they may be, have no other principle.

All the ſtones that we know, may be comprehended in two claſſes; one of lime ſtones; and the other known among naturaliſts, under the name of *quartz* or flints. The firſt is the moſt common, both upon and within the earth; nay, even the rain-water contains a quantity of ſtony materials of this kind: for if we let one drop of this water fall upon a ſmooth piece of glaſs, and evaporate it haſtily, we ſhall be aſtoniſhed to ſee the quantity of ſtony matter which it leaves behind. This experiment ſucceeds ſtill better, when in lieu of a drop of rain-water, we uſe a large hail-ſtone. This ſtony-matter abounds very much in ſpring-water, and we know abundance of wells, in which bodies being thrown, will in a little time be covered with a ſtony-cruſt. Nor is river water exempted from it; nay, the cleareſt rivulets are impregnated with an infinite number of tranſparent and delicate flints that are ſucceſſively formed in its water.

After having eſtabliſhed it as an inconteſtable fact, that water comprehends and ſuſtains a great deal of ſtony matter, it will not (I believe) be diſputed, that of this ſubſtance ſtones are formed,

which often ſurround other bodies; and hence are produced the petrefactions of animals and plants. It is not always neceſſary that the water ſhould evaporate, in order to depoſite the ſtones and earthy ſubſtances as a ſediment: theſe particles being ſpecifically heavier than water, fall to the bottom by virtue of their own weight, and then by reciprocal contact, attraction and union, they are often formed into one ſtone.

By theſe means we can eaſily conceive how whole banks of ſtone may be formed in water, as we ſhall ſee below; and though M. Linnæus and other able naturaliſts conſider white clay and ſand as the firſt elements of ſtone, I cannot ſubſcribe to that opinion, becauſe, if that was the caſe, all the ſtones of the earth would partake of the nature of glaſs, whereas, the greateſt part of the ſtone-beds of our globe, are formed by limeſtone, which conſqeuently, ought to have another origin. Both white clay and ſand partake of the nature of glaſs, which properly ſpeaking, is no other than bruiſed flint; and to me it ſeems incomprehenſible, that theſe two ſubſtances ſhould form all ſorts of ſtones, unleſs we ſuppoſe that they are both upon the ſurface and within the earth, operations like thoſe that are performed in a brick-kiln. Beſides, we know that lime itſelf, as well as any other ſubſtance, may be vitrified by the force of fire, without a poſſibility of its being reduced again to its original ſtate; for we do not find in nature the leaſt veſtige of glaſs changing

changing or rather returning to the ſtate of lime. On the contrary, we obſerve that nature invariably follows the rules preſcribed by the Creator, from which ſhe never deviates.

Wherefore, if we could even conceive white clay and ſand to be the origin of ſtones that partake of the nature of glaſs, we could never from thence deduce the formation of thoſe limeſtone banks, which extend themſelves ſo regularly under ground, and which indeed, owe their origin to nothing elſe than water.

By a bank of ſtone, I underſtand a lengthened maſs of the ſame kind of ſtone, raiſed by layers, of which there are ſeveral above one another. This may be repreſented by a book lying upon a level, whoſe leaves reſemble the layers in the ſame manner, whether the ſtone partakes of the nature of ſlate, lime or ſand. If we reflect upon this ſituation, and diveſt ourſelves of all prejudice, we ſhall be eaſily convinced, that nothing but water could have formed theſe layers. Theſe banks, and the earthy ſubſtance which bounds them on both ſides, often extend a great way, in a ſituation perfectly horizontal, which they would certainly have every where preſerved, if they had not been broke by terrible ſhocks, of which we find manifeſt proofs, and which are ſo many irreſiſtable evidences of one or ſeveral capital revolutions which our globe muſt have undergone.

I will go farther. Not only theſe banks of ſtone, but even the moſt ſolid and tranſparent pebbles, derive their origin from water. Not even excepting the *ſpath* or the *quartz*. M. Neuman, in his leſſons of chemiſtry, ſays that *ſtones are formed of a kind of mud inceſſantly agitated in water, which, by means of this motion, is more and more inſpiſſated, until it congeals and petrifies by the natural coldneſs of the water.*

It is really very remarkable, that every country has its peculiar ſtones, and theſe are always ſuch as approach neareſt to the ſoil that ſurrounds them. Thus, for example, upon a mountain in the county of Mansfeldt, the ſoil of which, is of a reddiſh hue, we find a *quartz*, of a white and red colour. This ſtone, is without contradiction, produced in the very ſpot; and owes its colour to the nature of the ſoil in which it is formed. At a little diſtance from thence, we find a very different kind of ſtone, which has red and brown layers, and partakes of the nature of lime, without reſembling the firſt in any particular. The beſt earth ſeems to be no other than fine ſand mixed with rotten vegetables; for it crunches between the teeth; and what will hardly be believed, the *ſcoria*, which is nothing but glaſs, yields with little trouble, and in a very ſhort time, the beſt garden-earth. Good earth is proper for making bricks: but they cannot be made of lime. Let us then begin, by conſidering the origin of the delicate and ſolid ſtones.

The

The quarry of Groſorner in the county of Mansfeldt, is formed by banks of a bluiſh ſtone, of which lime is made. The crevices and vacuities are filled with a kind of yellowiſh white clay, in which are found fine tranſparent chryſtals, moſtly hexagons, or of ſix ſides, which yield to the Bohemian diamonds in nothing but in ſize and hardneſs. The crevices that contain theſe, croſs the banks of ſtone; and in certain places are about two inches broad; in others, they are ſcarce half ſo broad; as their depth increaſes, their breadth diminiſhes, that of two inches being often reduced to one half, and very frequently croſs one another. The direction of the ſtone-bank almoſt always runs from weſt to eaſt, and the ſlope faces the ſouth. The ſoil of this quarry is a reddiſh clay, under which there is looſe ſand. The depth of this clay, is in ſome places, from ſix to ten feet, but that of the ſand, ſcarce exceeds one foot. It is plain, that thoſe ſmall diamonds are formed in the crevices: for, ſome of them ſtick faſt to the clay, and theſe are always rougher and leſs tranſparent than the reſt. What is very extraordinary, in this clay are found ſmall pieces of *ſpath*, very firmly united, ſo as to make but one body with ſome ſmall ſplinters of the ſtone-bank. This yellow clay being made red-hot by a ſlight fire, becomes a very ſubtile *crocus martis*, and yields a fine delicate red colour *.

* In the ſame quarry were found a bone and a tooth which could not have belonged to any ſpecies of crea-

At firſt, it ſeemed to me very improbable that thoſe ſtones were created at the beginning of the world, and the more I examined them I was the more convinced, that they muſt have been new productions of nature, which is ever in agitation. In effect, thoſe crevices, which are now filled with yellowiſh clay, muſt have been occupied by a vitriolic water impregnated with iron: which water has gradually precipitated the clay, as all vitriolic lye or menſtruum will do, and in time formed a kind of vein of it. Beſides, it would be no difficult taſk to prove from the principles of natural philoſophy, and thoſe of mining, that thoſe crevices have been filled with water, for ſome of it, even at this day, pierces to the ſurface of that ſoil which lies over the quarries. This water muſt have been impregnated with ſomething elſe than ſimple ſtony matter, as plainly appears from the *crocus martis* extracted from the clay; but as it could not run freely, its ſubtile and aerial particles evaporated, leaving the groſſer parts behind. On the other hand, there is above this quarry, a

tures now alive upon the earth. They are preſerved in the precious collection of M. Hoffman officer of the mines. The tooth is intire, of very fine ivory, terminating in ſeveral forks. The bone is very big and broad, but ſhort in proportion to its breadth. They ſeem to have belonged to ſome ſea-monſter, the ſpecies of which has undergone the ſame fate with that of the creature which bore the horns of Ammon, and which no longer exiſts upon the earth.

bank

bank of ſlate which yields ſome copper and ſilver, which at the ſame time partake a good deal of the nature of iron, as the miners daily find to their coſt; ſo that it is not difficult to conceive from whence the water extracts its clay.

As to the formation of little diamonds, it ought to be ſuppoſed the very ſame with that of ſalts: they partake of the nature of glaſs, and never loſe their brilliancy in the fire, and I will prove below, that the ſalts are the natural cauſe of their figure.

The *ſpath*, which is ſtrongly united with the ſplinters of ſtone, is formed of the moſt groſs and terreſtrial particles of the water, while the more ſubtile parts produce the diamonds. Do not we learn every day, by chemical analyſes, that precious ſtones, for the moſt part, contain ſomething mettalic? Thus, even the diamonds in queſtion, ſwim as it were in a clay richly impregnated with iron, and own it for their proper matrix.

Nay, we frequently find, upon the ſurface of the earth, a quantity of ſtones which have been formed in the clefts of rocks, as all the naturaliſts agree. The accretion of the *pyrites*, of mixed maſſes, of *ſpath* and *quartz* whether impregnated with water or not, are no other than ſtones newly formed, and the *pyrites* corroded by time, are

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no other than ſtones diſſolved by the weather, and changed into earth.

Nevertheleſs, we muſt diſtinguiſh this kind of formation of ſtones, from that petrefaction which only cloaths bodies with a ſtony cruſt. The ſprings which forms theſe ſtones, as that of Carlſbadt, and a number of others, make no impreſſion upon the body that is immerſed, and the cruſt with which they ſurround it, is a coarſe ſubſtance that partakes of lime. This is not the caſe in the formation of the firſt kind of ſtone; for, the maſſes which it produces, contain nothing heterogeneous.

The moſt difficult point to determine on this ſubject, is how thoſe maſſes have been formed with ſuch art and order, they being often found ſo well faſhioned, that the moſt dextrous lapidary could not mend or improve their ſhape. Shall we call to our aid thoſe ſubterraneous ſpirits, who amuſe themſelves, perhaps, in working and poliſhing theſe chryſtals, and in adjuſting them to the crevices of the rocks, and the torn banks of ſtone? This, at leaſt, was the opinion of our anceſtors. Lavater, in his treatiſe *de ſpectris lemuribus*, &c. page 1. chapter 16. and even the learned Agricola, in his dialoge *de re mettallica*, &c. openly affirms, that there are ſpirits in mines, who reſemble the miners in every particular, and live familiarly with them. But theſe viſions are not to the taſte of this age, and none of our miners now alive will

will boaſt of having ever converſed with that ſort of ſpirits. But if it is ridiculous to attribute the regular formation of thoſe chryſtals to the induſtry of the ſubterranean ſpirits, it ſeems no leſs improbable to conceive that the ſmalleſt, original particles of theſe chryſtals, are diſpoſed in ſuch a manner, that they can only attract the hexagonal particles of the water, in order by theſe means to form ſtones of the ſame figure. Why ſhould we ſeek to determine phyſical effects with ſuch preciſion? Perhaps it is the nature of theſe ſtones to be hexagons, in the ſame manner, for example, as are the chryſtals of ſalt-petre. Even theſe ſtones are without contradiction, united with ſaline particles, as they are formed in a vitriolic and martial earth; and if it is difficult to prove to the finger or eye, by means of chemiſtry, the exiſtence of theſe particles, it is becauſe their formation is as much concealed from us, as that of ſalts, ſnow, &c. Upon which ſubjects, even thoſe who flatter themſelves with having inveſtigated them with the moſt profound attention, can give us very little poſitive information.

It is certain, therefore, that our ſmall diamonds owe their origin to water, although it is not poſſible for us to explain exactly the manner in which they are formed. But we muſt not imagine, that the vegetation of ſtones is performed in a hurry: A very conſiderable ſpace of time is requiſite, before a ſtone of homogeneous matter becomes as large as a grain of muſtard, notwithſtanding the

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assertion of M. Leſſer, who pretends to have obſerved that ſtones grow in a very little time. That learned naturaliſt relates, in his *Litho-theology*, n. 384. that having put a certain number of ſmall ſtones in a rivulet, he found them conſiderably increaſed at the end of the year. I cannot help doubting the exactneſs of this obſervation: for, ſuppoſing theſe ſtones to have increaſed no more than a hair's breadth in their whole circumference, and that would be a very conſiderable augmentation for one year; I aſk how M. Leſſer could poſſibly have obſerved it? And if the ſame increaſe had gone on for ſeveral ages, why was not the little rivulet long ago blocked up by its own ſtones ſo conſiderably augmented? By the unanimous aſſent of all the naturaliſts, the formation of the terreſtrial and ſtony cruſt, and even the generation of new ſtones, is not performed with more expedition in any place than in the ſprings of Carlſbadt and the grotto of Bauman; yet according to the report of M. Leſſer, they ſhould be performed infinitely faſter in his rivulet, the water of which is extremely clear, and runs in very ſmall quantity. The figures to be ſeen in the grotto of Bauman were there when it was firſt diſcovered, and who can tell how much time was elapſed before they attained their preſent dimenſions? In effect, if the vegetation of ſtones, which ought to be performed as quick as poſſible in this grotto, becauſe of the quantity of water which inceſſantly diſtils, was ſo ſenſible as M. Leſſer ſeems willing to make us believe, the figures

figures reſembling the ſugar-work would have been a long time ago conſolidated into one ſingle maſs, together with all the vaults and kinds of ovens therein contained. On the contrary, I am firmly perſuaded, that more than a whole century muſt neceſſarily elapſe, before one crevice of this grotto, which is an inch wide, will be conſolidated by the increaſe of the ſtone. True it is, one drop of water contains a drop of terreſtrial particles in proportion to its volume; but can it precipitate them equally every where? It will have no ſediment while it is in motion; and it is capable of engendering ſtones only while the fluid is at reſt, and can quickly evaporate. Now, how many drops of water muſt be evaporated for the formation of a ſtone of the ſize of a grain of ſand? After all, we are not without examples in nature, of a very ſlow vegetation, and without looking for any other inſtance, how many years muſt paſs before an oak or any other tree of ſolid wood arrives at the thickneſs of a man's arm? It ſeems plainly proved therefore, that our ſmall diamonds require a conſiderable time to become ſo large as they are, and this truth is fully confirmed by their hardneſs. Indeed that hardneſs can proceed from nothing but the ſtrong coheſion of their parts, and the cauſe of that coheſion can be attributed to nothing but the great number of points of contact, which are the more conſiderable as the particles that touch one another are ſo ſmall. Now, the ſmaller theſe particles are, the more

time

time is required for their forming a body of any ſenſible bigneſs: indeed, by receiving more nouriſhment and growth from the water, they would by virtue of their more conſiderable volume have formed the ſame body ſooner; but then it would have been leſs ſolid. Therefore nothing is more difficult than to determine the age of thoſe ſmall diamonds.

The crevices found in the bank of ſtone, are certainly not of a late date, ſeeing we ſhould have heard of ſome earthquake which muſt neceſſarily have accompanied their formation; and if it required whole ages to fill up theſe crevices, and produce the ſmall chryſtals they contain, how much time muſt have been conſumed in the formation of whole banks of ſtone, immenſe rocks, &c? Be that as it may, I ſee no other origin or principle of growth in ſtones, but water; and the greateſt part of natural philoſophers tacitly aſſent to this opinion, when they ſay that all ſtones have once been fluid, that is, water is the origin of all the ſtones that are found upon the ſurface, and in the bowels of the earth; and that matter may not be wanting in theſe new productions, it takes away from ſome places, in order to convey it to others.

Lime-ſtone ſeems to be the only proper body for nouriſhing and imbibing the water of ſtrong particles, which diſſolves it, and is received into its ſubſtance in a very little time. But even flint-ſtone,

flint-ſtone, in ſpite of its hardneſs, which ſeems inſurmountable by water, is not exempted from this diſſolution. Break one of the black and hardeſt kind of them, and expoſe it for ſome years to the open air, you will find its ſurface intirely changed from its former ſtate and appearance. In all the flint-ſtones, we find the exterior cruſt is always ſofter than the interior ſubſtances: and we may in ſome meaſure preſume, that the kernels of flint-ſtones are ſplinters of a ſubſtance, which is much harder than the cruſt that ſurrounds them. Slate, which is hard and firm enough when taken from the mine, intirely diſſolves in a little time, when expoſed to the open air. I am not ignorant that this diſſolution is commonly attributed to the acid with which the air is impregnated; but in my opinion, it is difficult to conceive how this can be performed without the aſſiſtance of water, and I think I do not advance too much, in ſaying that rain is more capable of diſſolving ſtones, than air. *Gutta cavat lapidem, non vi, ſed ſæpe cadendo.* A drop of water hollows a ſtone, not by its ſtrength, but by its frequent falling; and in order to be convinced of this truth, we have nothing to do but to obſerve the flint-ſtones which are immediately under the gutters. Beſides, how ſhould the ſtony ſubſtance be found in rain-water, if it was incapable of diſſolving ſtones? Nevertheleſs, a conſiderable time is no leſs requiſite for their diſſolution and total deſtruction, than for their vegetation.

Water

Water may engender ſtones in more than one way, and as far as I have been able to acquire information, in examining the different mines of my native country (Saxony) and profiting by the lights of our moſt able miners and naturaliſts, I have diſcovered three different ways in which ſtones are formed. Not that I pretend there are no others: nature amuſes herſelf with variety in her operations, the ſprings of which ſhe knows ſo well how to conceal, that the greateſt naturaliſt would be the raſheſt of mankind, if he preſumed to boaſt of having diſcovered the whole.

The firſt way of engendering ſtones, is that which we have conſidered with regard to our little chryſtals and other ſtony and mineral maſſes. I might have entered into the detail of the formation of metals, and explained the manner in which part of their ſubſtance is conducted in the bowels of mines by the conveyance of water; but I was afraid of deviating too far from my plan, which is to treat of nothing but the vegetation of ſtones.

The ſecond ſpecies of ſtones formed by water, partakes alſo of the nature of glaſs. It is a ſandy ſtone, very rough, compoſed of bits of white, grey, blue and red flints, united together. This kind of ſtone is, among others, found immediately under the beds of ſlate in the mines of the county of Mansfeldt. It is the moſt tender and uniform in that

that place where it touches the ſlate, from which it extends to the depth of ſix barley-corns or more. The ſtones that compoſe it, are from the bigneſs of an egg, to that of a grain of ſand; whence we may conclude with great probability, that it is no other than a heap of broken ſplinters and ſtones: the matter which keeps theſe pieces united together, diſſolves in the air; but the pieces themſelves remain entire, in conſequence of their hardneſs. We ſee conſiderable banks of this ſtony maſs more than a league in length, raiſed even upon the ſurface of the earth, about Mansfeldt and Hull, and upon the banks of the river Saale. Theſe ſtony concretions may be explained by the theory of the mud or ſlime of M. Neuman, who looks upon that viſcous matter as very capable of glewing the ſtones together. For this purpoſe, the pieces muſt have been laid over one another in a very uniform ſituation, that the water might ſurround them for a long time, ſtamp, as it were, one upon another, filling up the interſtices of the ſmalleſt ſplinters, and of the duſt that was mixed with them. Beſides, we know by experience, that thoſe ſtony maſſes contain a quantity of water; and it is a rule among the miners, always to ſtrike upon a good deal of water, when the bottom of the mine is too much hurt.

In order to convey a better idea of the formation of ſuch a ſtony maſs, and its concretion by means of water, I ſhall relate an experiment

of M. Hoffman, officer of the mines, although it was made with another deſign. He put ſome handfuls of ſand into a glaſs retort, and having poured ſome water above it, threw in a little fiſh, to know how long it would live without any other nouriſhment than water, and what ſituation it would aſſume in dying. The water having evaporated by ſlow degrees, the fiſh, as it conſumed by putrefaction, left the print of its body upon the ſand, which was almoſt changed to ſtone; and this impreſſion was crooked in the ſame manner as that of the fiſh which we find printed on ſlate.

It may be imagined I now contradict what I have advanced above; namely, that ſtone cannot be formed of pure ſand; but we muſt take notice that the ſtones here mentioned, are not compoſed of ſimple and homogeneous parts; but rather are concretions of a quantity of pieces partaking of the nature of glaſs: for, being expoſed to the air, they diſſolve as ſoon as the true ſtony matter which unites them, is looſened; and this alone, or rather the water from which it is ſeparated, is the cauſe of the concretion of this maſs.

In my opinion, pure ſand will never produce a ſtone, unleſs water be added, even though mixed with white clay. The celebrated Leibnitz, in his *Protogæa*, n. 18. pretends that the flint, the *quartz*, the ſlate, alabaſter, &c. are maſſes that have been melted by fire: but, according to that ſentiment, we ſhould be obliged to own, that nothing but *quartz*,

quartz, flint, ſlate, &c. would be found on the ſurface or in the bowels of the earth; and if that pretended fire had been univerſal, all the metals, vegetables, and animals, as well as the ſtones, would have been put in fuſion, as Mr. Leibnitz himſelf confeſſes, and proves by arguments drawn from experiment, the *ſpath* which is ſpread in plenty over our globe, and eaſily put in fuſion, would have been changed by the fire into *ſcoria*, rather than into lime; and by theſe means we ſhould have had an earth of glaſs.

But, let us for a moment ſuppoſe, that the ſtones were formed by fuſion, in a conflagration of the earth, how ſhould new ones be formed in our days? And from what origin ſhall we derive the regular figures which we obſerve in them? The fuſion of ſcoria never produces any thing regular. On the other hand, we never ſee glaſs diſſolving in the air and water, as ſtones are diſſolved. And what more can we aſk, after the illuſtrious Boyle has aſſured us, he had in his own poſſeſſion a diamond that contained a drop of water? Captain Linſcot likewiſe obſerves, in his voyage, that in the diamond mines of India, which were exhauſted after a certain number of years, they found ſtones newly formed in the room of thoſe which had been taken away. I therefore aſk, if water ſhould not alſo be owned as the origin of ſtones of the ſecond claſs?

I now come to the third claſs, which is lime-ſtone; and is diſtinguiſhed from *quartz* or flint, by the leſs ſolidity and union of its parts: it likewiſe diſſolves more eaſily, in the air and in water, and by a ſlight fire is changed more or leſs eaſily into lime, according to the difference of its kind. There are two general claſſes of it; namely the ſtones of plaiſter, among which we reckon all ſorts of alabaſter, marble, ſpath, &c. and the ſtones of which the ordinary lime is made. In both theſe claſſes, the greateſt part of petrefactions are found, whether in ſhells or in vegetables. Marks of them are likewiſe (though rarely) found in ſandy ſtone: the animal or the plant itſelf is never found, nothing being left (as it were) but the mould. Sea-plants, all ſorts of coral, mother of coral, the greateſt part of ſhells, and among others, that famous one known by the name of *cats-head*, of which they make lime in the Indies, are no other than different kinds of plaiſter. Now, as theſe kinds of plaiſter are always found in the ſea, as in their proper place, it is not difficult to divine where they fetch their origin. In effect, the beds of thoſe ſtones with the petrefactions which they encloſe, ſhew, that heretofore there have been ſeas in thoſe places, that is, they are beds or channels of the ſea, the water of which hath run off or been evaporated by ſome cauſe or accident of which we are wholly ignorant. Thus, (to ſpeak of the lands in our neighbourhood only) the ſlates of Mansfeldt, with their impreſſions of fiſh,

fiſh, the ſingular quarries of Querfurt, the mountains of plaiſter in the neighbourhood of Nordhauſen, the fine, white mountains of ſpath, and a quantity of other remains ſcattered about in theſe places, are ſo many evident proofs that there have been ſeas from which all thoſe ſubſtances have drawn their origin. Neither inundation, earthquake, or any other ſuch revolution could have produced thoſe ſtones printed with fiſh, ſhells and other ſea-animals petrified: the banks of ſtone that contain them are very regularly diſpoſed, riſing by beds, and the petrefactions they contain, almoſt always reſt upon their center of gravity.

I have ſaid above, that every diſtrict uſually produces its peculiar claſs of ſtones. In the places I have mentioned, and chiefly in the county of Mansfeldt, where theſe banks of ſtone are found, they are always obſerved to follow the direction of the ground, with which they regularly riſe and fall: for which reaſon, I imagine they are formed in the following manner. I firſt of all ſuppoſe the whole diſtrict to have been a bed of the ſea, the waters of which were gradually loſt: the ſubtile mud of the water beginning to ſettle, formed the firſt bed, which having attained its due conſiſtence, was followed by another, that by a third, and ſo on. Should it be aſked, from whence did the water acquire all the terreſtrial materials for the compoſition of thoſe ſtones? I anſwer, it acquired them from the ſame ſtore that furniſhes the rain-

water with the terreſtrial particles, which it depoſites upon evaporation.

Moreover, I think I have a right to ſay, that as a ſtone gradually diſſolves in the open air, ſo likewiſe it is formed by ſucceſſive appoſitions or accretions. When a ſlate remains for ſome time, expoſed to the air, it decays ſhell after ſhell, juſt as it was formed; and thence we may eaſily conceive, how the fiſh that are there found may be preſerved intire, and ranged as well as the petrified ſhells, in very regular beds exactly parallel with the ground that encloſes them. If thoſe ſtones had been brought thither by inundations, heaped together by aſhes, or otherwiſe, we ſhould not ſee them forming altogether the ſame homogeneous ſtone, like thoſe banks of lime-ſtone; there would infallibly be a mixture of other bodies, or at leaſt of ſtones and earth of different kinds, and the whole would be found in the laſt diſorder, inſtead of the perfect regularity which is now obſerved.

But, you will aſk me, whence come the vaſt mountains of lime, and how were they formed? I anſwer, they owe their origin to the billows of the ſea, and have been formed during the great revolutions of our globe. Do not we ſometimes ſee new iſlands ariſe? Whence come the oyſter-ſhells which are found in ſuch quantities under ground, in ſome parts of England, as we are aſſured by Ray, in more than one place? Why are the

the coaſts and rocks of England on both ſides, wholly of chalk? The reaſon of it is plain: becauſe both owe their origin to the ſea.

Coral and the ſhell called *cats-head*, which we have mentioned above, are no other than maſſes of ſmall ſhells laid one upon another, ſo as to form a true plaiſter, whence we may conclude, with great probability, that the ſtones which partake of the nature of plaiſter, derive their origin from the ſea.

After this we ſhall be no longer aſtoniſhed when we read in Ray, that according to the report of Miſſon, in his voyage to Italy, there was a living lobſter found in the midſt of a piece of marble. We ſhall likewiſe comprehend how it is poſſible, according to the relation of Brand, that a certain gentleman ſhould eat muſcles which had been dug out of the earth with the plough, and that near to the town of Mold in Flintſhire, in the ſame kingdom, there ſhould be found in the ſand which was about three feet deep, ſhells in which there were living fiſhes. Theſe extraordinary phænomena of nature, are eaſily explained by the example of the ſhell called *cats-head*. The layers which the ſea-water brings to theſe ſhells augmenting their bulk conſiderably, they often attain to a monſtrous ſize, and the growth of every year may be diſtinctly perceived; but the animal makes uſe of a pipe which is always open, and from which it draws its ſubſiſtence from the ſea-water. In all probability, this was the caſe

with the lobſter contained in the marble, which is nothing elſe than a kind of plaiſter. Indeed nothing ſo eaſily diſſolves in water as plaiſter-ſtone, and it attracts a conſiderable quantity of it into its ſubſtance. I could recount ſeveral other examples to confirm my opinion, were I not afraid of deviating too much from my ſubject.

I think it unneceſſary to enter here upon large deſcriptions, to decide whether or not ſtones contain ſalt; and although naturaliſts are not agreed among themſelves, on this ſubject, it is in my opinion impoſſible that they ſhould be without ſalts, ſince it is proved by the principles of chymiſtry, that ſalts are abſolutely neceſſary for the ſolution of bodies and metals in water. Do not we know that there is in nature, a quantity of ſalts very difficult to diſſolve? Arſenic is nothing but a ſalt which diſſolves intirely in water. Smalt, known by the name of azure, tinctures the water blue, becauſe part of it diſſolves; yet it is nothing elſe but glaſs made of cobalt and ſand. Lime diſſolves bodies, when mixed with water, and it is not without reaſon, diſtinguiſhed by the name of *cauſtic alkali*.

Let us not ſay that thoſe ſalts are carried into ſtones by fire, although I do not deny that its action may the more unfold and greatly exalt their virtue. Thoſe ſtones, without contradiction, naturally contain ſalts. We have ſeen above, that the *quartz*, or moſt ſolid flints, are diſſolved in water,

water, though indeed, more or leſs properly, according to the different temperature of the air. Lime-ſtone diſſolves in a very little time, often in an inſtant.

Beſides, though it is certain that a body contains ſalts, when it diſſolves in water, either wholly or in part, and communicates a taſte to the fluid; it does not follow that a body muſt be entirely deſtitute of ſalt, when we do not perceive any of theſe effects. The banks of ſlate containing petrified fiſh in the county of Mansfeldt, are covered with banks of a ſtone called *puante*, or ſtinking. This is likewiſe a kind of grey ſlate, which derives its origin from ſtanding water, in which the fiſh had rotted before they were petrified. It has no ſmell after it has been expoſed for ſome years to the open air; but it diffuſes a very bad odour when the people work upon it, or bruiſe or rub it with violence; and this ſtench can only be attributed to the urinous ſalts it contains, which act only when they are put in motion. The ſame thing happens when we pour aquafortis upon it; as likewiſe to ordinary lime, when it is mixed with ſal ammoniac.

I ſhall conclude with ſome examples which evidently prove the ſtrong diſſolution of lime-ſtone in water. Thus we ſee, in the mountains of lime-ſtone in the county of Mansfeldt, a quantity of immenſe caverns formed by the water, which gradually corrodes the lime-ſtone, continually advancing

vancing every way; and thus was formed the great lake at the foot of the mountain of lime-ſtone, near the town of Nordhauſen. Theſe ſubterranean operations of the waters, often cauſe the earth to crumble and ſink down; for when they have conſumed the lime-ſtone, and the ſides of the mountain being ſoftened, begin to give way, the earth above neceſſarily crumbles, and ſooner or later will ſink down. Wherefore, in order to explain theſe accidents, it is not always neceſſary to have recourſe to earthquakes, or the action of ſubterranean fire, ſeeing water alone is capable of producing them. The famous grotto of Beauman is no other than ſuch a cavern hollowed in the lime, by the continual action of ſubterranean water. The upper part of that grotto is of pretty ſtrong lime-ſtone, but below it is very ſoft. The water that ſweats from all parts of it, diſſolves, and carries off the particles of lime from the places through which it paſſes, and depoſites them elſewhere in the lower part of the grotto; and this tranſpoſition forms that aſtoniſhing variety of all ſorts of beautiful figures, the ſubſtance of which is the fineſt and moſt ſubtile lime, as I myſelf have obſerved in viſiting that grotto.

MEMOIR

MEMOIR upon the manner of breeding Silk-worms in France, and all other Climates where Mulberry-trees can be cultivated. By M. de GOYON de la PLOMBANIE.

A Pretty long ſtay which I made in the ſouthern provinces of the kingdom, where ſilk-worms are bred, together with what I have read in the beſt authors, have enabled me to ſhew the public, that the method commonly followed for this purpoſe, does not anſwer the end propoſed.

In the Indies and all other places where the climate allows people to breed ſilk-worms on the trees, like our caterpillars, the ſilk is very fine, very ſtrong and in great abundance. Whence we conceive that a pure and temperate air is neceſſary to thoſe very delicate animals, which muſt be kept very clean, and breathe with difficulty in a confined and thick air, from which they contract diſorders. In thoſe happy eaſtern climates nature of herſelf performs her operations, but with us, ſhe requires the aſſiſtance of art: art, therefore, ought to correſpond with nature, ſo as to aid her effectually, without ever doing her the leaſt violence.

When

When I was in Languedoc, I obſerved that in the cold mornings, the ſilk-worms were benumbed and moved but very litle; and that of all the chambers in which they were bred, thoſe which had moſt light, the freeſt air, and were expoſed to the ſouth, ſucceeded infinitely better than the reſt; that thoſe people who were leaſt careful in keeping them clean, could never turn them to account, and for want of this precaution a number of them periſhed, after they had been raiſed at a great expence. In this reſpect they are ſo delicate that the leaſt impure or ſtrong ſmell throws them into convulſions; people of ſtinking breaths, rank reſpiration, or they whoſe ſweat is of a diſagreeable odour, nay the ſmell of women at certain times, is pernicious to theſe animals, and does them more injury than one would imagine.

A variety of food gathered from different ſoils and different trees, contribute to render the ſilk unequal: the leaves being gathered wet, given after they are faded, or mixed together without ſeparating the tender from the harſh, the worms eating at intervals, or of what they diſlike; all theſe circumſtances, which too often occur in the method of breeding them, practiſed in France, greatly contribute to the little ſucceſs and returns of the manufacture; yet, hitherto, I have not ſeen one perſon employ himſelf as he ought, in finding means to remedy theſe inconveniences. This conſideration has determined me to communicate to the

the public, my own ideas of the ſubject; and after I ſhall have given a detail of them, any perſon can try the experiment in miniature, that he may aſſure himſelf of the utility of my method.

Some methods which may be uſed in making Silk in France, ſo as to render it abundant, and of good quality.

PAINS muſt be taken to have a number of mulberry-trees; they may be planted in all ſorts of ſoils where they will grow, but they muſt not be ſhaded by any other ſort of trees. Almoſt all the ſoils that produce walnut-trees and elms, will agree with the mulberry: and they muſt be carefully ingrafted with that kind, whoſe leaf is the moſt broad and ſmooth.

Remarks upon the different Soils and qualities of the Trees.

ALL thoſe trees that riſe in light, barren, ſandy grounds, that have little moiſture, will produce the fineſt and ſtrongeſt ſilk: while thoſe which are produced in fertile, fat ground, abounding in juice, yield a coarſer and weaker ſilk. Young trees, from ſix to twelve years old, will produce ſilk that is neither ſo fine nor ſo good as that from trees of eighteen or twenty years growth; ſo that the oldeſt are always to be pre-

ferred. It is the ſame caſe with mulberry-trees for ſilk, as with vines for fruit, which is different in quality according to the different ages of the trees, and the difference of ſoil. Nature always makes one thing attone for another; the old vines, and thoſe that are planted in a meagre ſoil, produce the beſt wine, though in ſmall quantity; thoſe raiſed in a fat ſoil, produce a larger quantity, but of an inferior quality; ſo that both kinds, nearly yield the ſame profit: the ſame thing will happen in ſilk, if we do not mix the produce of different ſoils, and different trees. This is an eſſential remark for the œconomiſt, though he has not hitherto regarded it. The practice is to mix the leaves, and give them indifferently to the worms; but it has been obſerved that a worm fed with leaves of different qualities, always makes an ill formed ſilk, as may be perceived by the microſcope. Worms thus managed will be like a ſpinſter, who puts indiſcriminately flax and hards upon her diſtaff; and cannot poſſibly ſpin thread ſo good and equal, as if it had been made ſolely from one of theſe materials. If the Indian ſilk is ſo beautiful, uniform and ſtrong, it is becauſe the worms eat only of the leaves of one tree, on which they have been bred, and care is taken to pick the cods, ſo as that the beſt are kept together.

From theſe remarks it follows, that we ought to furniſh thoſe little animals with a lodging which would procure to them, as much as poſſible, the ſame advantages they enjoy in thoſe countries.

countries, where they thrive without care, that is, to ſhelter them from the injuries of our climate, to procure for them a pure temperate air, that ſhall be continually renewed; and give them a great deal of light, which contributes to their health; to clean them gently every time they receive new food, without touching them with the hand or any ſort of inſtrument: finally, if we cannot ſecure them from the noiſe of thunder, at leaſt to free them from the ſight of lightning which gives them more diſturbance, by the quick and violent vibration of their little optic nerves, which incommodes their circulation, and affects them with diſtempers. If care be taken to prevent all theſe dangers, by the means which I am going to deſcribe, we may be aſſured of having worms that will ſucceed to a miracle.

Of the Lodging of Silk-worms.

WHEN the deſign is to raiſe a great quantity of ſilk-worms, ſo as to profit by the income they will produce, it will be neceſſary to build on purpoſe, a lodging wholly detached, for raiſing the worms, proportioned to the quantity of the owner's trees. For example, if the ſcheme is to make five hundred pounds weight of raw ſilk, the lodging muſt be eighty feet long, and twenty feet broad, with three ſtories, comprehending the ground floor, and every ſtory muſt be ten feet high, excluſive of the thickneſs of the roofs, which

which ſhall be plaiſtered, if plaiſter is to be eaſily got; if not, there muſt be a cieling of boards joined together as well as poſſible, upon which ſeveral folds of brown-paper muſt be glued, to hinder dirt and duſt paſſing from one floor to another; for nothing is more hurtful to the worms.

The houſe ſhall extend from north to ſouth, fronting the eaſt and weſt. The ends oppoſed to the north and ſouth, ſhall be built up without any opening; ſo as that there ſhall be no admiſſion either to the north wind or ſouth-ſun, which are equally prejudicial to the worms: but the two fronts to the eaſt and weſt ſhall have windows oppoſite to each other, ſix feet broad and in height from the cieling to the floor, with an interval of four feet only between them. Each of theſe windows muſt be ſhut by two ſaſhes of glaſs, or at leaſt, in lieu of glaſs, be covered with white oiled paper. Theſe ſaſhes muſt open ſideways upon little ſliders, like the ſcenes in the opera; each ſhall be three feet and an inch broad, and ſlide behind the frame of the window, one againſt the other, for the ſake of convenience; and in order to keep out the lightning in tempeſtuous weather, there ſhall be within ſide, at the top of the window, an umbrello of wax-cloth, to exclude every ray of light. When this is to be uſed, the glaſs or paper ſaſhes may be ſhut by means of a roller, at one end of the apartment: a cord communicating with all the umbrellos, may be drawn, ſo as

to make them act together at once, either for admitting or excluding the light. Every artiſt will eaſily comprehend the nature of the contrivance. It will alſo be neceſſary to have a ſecond umbrello of coarſe canvas, on the outſide of every window, which will occaſionally ſerve to break the too violent action of the wind and ſun, and even of the hail, without excluding too much air or light.

Such a building may be executed of wood and mud, covered within and without by plaiſter or lime; if in a country abounding with ſtone, it may be executed in ſtone; the greateſt expence will be in the glaſs-work and umbrellos.

At the two extremities of this houſe there muſt be ſtoves a foot and an half broad, ſix feet long and two feet high, made of plates of caſt iron. Round each ſtove at the diſtance of half a foot, a little wall muſt be built of brick or tiles, which ſhall ſurround it, ſo as to hinder its heat from being abſorbed by the external air. In this interval, however, formed on all parts between the ſtove and the wall, a neceſſary quantity of air ſhall be introduced by a ventilator or bellows, made for the purpoſe, to be worked either by the wind or a little horſe. In cold weather the ſtove will be furniſhed with fire, to the neceſſary degree of heat, which may be communicated through the funnels, in the firſt apartment or hall, in order to be diſtributed: but great care muſt be taken

to prevent ſmoak. The air being heated in the intermediate ſpace of the ſtoves, will in like manner be diſtributed through the whole firſt hall, by means of a tin-pipe, which muſt run the whole length of it, and be furniſhed with ſmall holes proportioned to the diſtances; that is, the farther they are removed from the ſtove, they muſt be the larger and more numerous. Thus the air being heated between the furnace and its cruſt, will warm that of the hall, give it a ſuitable degree of temperament, and continually renew that which was foul, and this, as the ſaſhes are ſhut, in going out through the joinings, will reſiſt the external cold air which would otherwiſe enter.

It will be ſufficient to warm one hall in a houſe conſiſting of three, becauſe that will be enough for rearing the little worms, during the cold mornings of the ſpring; and when they grow large they may be diſtributed into the other halls in the order which we ſhall now deſcribe.

We muſt plant little poſts of oak half a foot broad on one ſide, and three inches on the other, at the diſtance of ſix feet between them. They muſt be fixed in a line acroſs the hall, and united by ledges of wood at the diſtance of twelve inches from one another; ſo that the poſts being ten foot high, there will be nine ledges: an interval of three feet and an half muſt be left from one range of poſts to the other, for the convenience of paſſing between them: the ledges being one inch

inch thick and three inches broad, ſhall be placed horizontally and mortiſed in each poſt; then boards of fir, a foot broad and ſix feet long ſhall be tied to theſe ledges with bits of leather or ſheepſkin in the manner of hinges, one on each ſide. Theſe hinges will allow the boards to be raiſed or lowered like the lid of a coffer; a cord at each end of the boards paſſing through pullies at the roof, and fixed to an hook at the lower part of the poſts, will actuate all the boards of the ſame ſide, like lettices; and if all theſe boards be kept in an horizontal poſition, they will ſerve as ſo many ſhelves upon which the leaves and the worms may be ſpread. Care muſt be taken to put nothing upon the board which is next to that where the worms ſhall reſide; but when you would renew the leaves, gently raiſe up the board on which the new leaves are placed, ſo as that the worms may ſee and ſmell them. They will not fail to go thither and abandon that on which they were, and this migration will afford time to clean the firſt and prepare it for the reception of new food when it ſhall be thought proper to furniſh it: and this gentle and continual exerciſe of the ſilk-worms paſſing and repaſſing alternately from one board to another, will keep up their appetites and ſtrengthen their bodies.

In order to make them yield ſilk, they muſt be preſented with bits of ſtraw and heath in the uſual way; theſe ſmall branches muſt be prepared on the next board, when it is perceived that they

will no longer eat; but ſeek to depoſite their ſilk and make their cods.

I ſhall not here treat of the different diſtempers to which the worms are ſubject during their moulding, abundance of authors having already performed that taſk; my ſole aim is to prevent the dangers to which they are expoſed, by deſcribing the attention which ought to be given, and the precautions to be taken in their lodging, in preſerving the air pure and temperate, and in managing the light, ſo as to ſtrengthen their bodies and excite them to eat.

There muſt be two places for the ſtore of leaves; in one they muſt be wiped upon cloth or a very clean board, when they are wetted by the rain; and in the other they muſt be preſerved cool and freſh, that they may not be too much faded. Beſides, it muſt be obſerved, that in very hot weather there falls upon the leaves a kind of manna or honey which is viſcous and very pernicious to the ſilk-worms; for it afflicts them with looſeneſs, makes them ſick and languiſh to death, or at leaſt deſtroys the beauty of the ſilk; the duſt of the roads too, that often ſticks to the leaves, incommodes and diſguſts the worms. Theſe inconveniencies may be alleviated, by putting the freſh gathered leaves in ozier baſkets and rinſing them ſeveral times in pure limpid water, which will waſh away the duſt, honey or manna. But theſe leaves muſt not be given to the worms, until after they

they have been wiped upon ſheets; and care muſt be taken not to let them lie any time in heaps, except in a very cool place, otherwiſe they will ferment and become ſtill more pernicious. By the choice of food and the regimen, the cauſes of diſeaſe are prevented.

Over and above theſe precautions, thoſe who have the charge of breeding ſilk-worms will be very attentive in chooſing the cods, and dividing them into three or four claſſes, that they may have the finer ſilk, and that it may not be rendered defective by a mixture of the good with that which is common; afterwards, no pains muſt be ſpared in unwinding the ſilk with all poſſible art, and if the threads break, as will often be the caſe, they muſt be ſupplied by other cods in the room of thoſe which have broke, and theſe muſt be thrown among the refuſe, as being of a defective ſilk, which would ſpoil the other. This advice I give with great confidence, being perſuaded that thoſe who follow it will find it turn to advantage.

Reflections upon the above remarks.

THIS memoir will meet with abundance of oppoſition, eſpecially among people bigotted to old cuſtoms; and therefore I propoſe to write to thoſe only who conduct themſelves by the rules of good ſenſe and reaſon, and are in a condition to profit by the new lights they receive.

What I propoſe is demonſtrated from nature; but if practiſed, the expence may ſeem to exceed the profit. It may, therefore, be neceſſary to undeceive thoſe who allow themſelves to be prejudiced againſt this memoir, by furniſhing them with means to try the experiment at a ſmall expence: for, it will be prudent to try the ſcheme in miniature, before it is undertaken at large, not only for informing one's ſelf whether or not the author has ſpoke truth, but likewiſe to know if there would be any real advantage in following his advice. In order to avoid all miſtakes, we muſt exactly obſerve the leaſt circumſtances, keep account of the time and expence which have been employed, together with the profits which have been drawn; and to compare this with the uſual method in due proportion, that we may ſee which of the two is preferable: this ſpirit of curioſity, inquiry and application is always uſeful; by ſuch occupation, we acquire inſtruction, and are inſenſibly conducted to uſeful and curious diſcoveries, which flatter us the more, as they are the fruit of our own ſtudy and meditation.

To begin: we may uſe a cloſet or any little place, which may reſemble the large building I have deſcribed, that is, be equally windowed, enlightened, aired and glazed, furniſhed with umbrellos to keep out the lightning, and the joinings may be ſecured with paſted paper. We muſt try to ſupply it with freſh air, to leave nothing that yields

yields a bad ſcent, and without uſing a ſtove, to procure warmth by a proper circulation of warmed air. When this ſmall apartment is put in order, furniſhed with moving boards ſuch as I have deſcribed, ſo as to fill up the whole capacity of the lodging, as much as may be, without impairing the convenience of paſſing; it may be tenanted by a quantity of worms ſuitable to the extent of the place.

In order to aſcertain the number, we muſt obſerve that one worm come to its natural growth occupies the ſpace of two inches ſquare. As it increaſes in bulk it requires more air: and when the ſeaſon is temperate, we run no riſque in opening the caſements in the day-time; but they muſt be carefully ſhut at night. According to this dimenſion, a board four feet long and one foot broad, may hold about three hundred worms; and a cloſet twelve feet ſquare and ten feet high, will contain eighteen thouſand; if we can make ten ſtories and three rows of ſhelves, theſe eighteen thouſand may produce as many cods; but as ſome of them always die, I reckon fifteen thouſand may turn to account: one hundred and fifty cods ought to produce one ounce of ſilk, when they are good; ſo that the fifteen thouſand will yield about ſix pounds of raw-ſilk. Thus, the curious obſerver will ſee whether his trouble and expence exceeds that of the ordinary method, by comparing the charge and profit on each ſide; and by including in this account, the loſs which is occa-

 ſioned

ſioned by want of care, he will find, if he is judicious, that his crop will be ſometimes augmented one half or at leaſt one third. If he is ſatisfied with this experiment, he may afterwards work at large, in proportion to the number of his mulberry-trees, build an houſe for the purpoſe, ſituated on a riſing ground, well ſecured from bad winds, and not in a bottom, which is always ſubject to miſchievous frogs and ſqualls of wind.

At the ſame time, he muſt take care to increaſe the culture of his mulberry-trees, without however planting ſuch a number as will hinder the cultivation of other neceſſary proviſions; and to make woods of them, as people make coppices; in which caſe the leaves will be finer and more eaſily gathered, and the wood will ſerve for firing. They may alſo be planted at random, without being ſubject to any ſort of cultivation, for we cannot have too many. This tree, when the ſoil is naturally good, may be uſeful by its wood, in a great many ſhapes: its leaves are a treaſure, the poultry and hogs are fed by its fruit which, indeed, is eaten by all ſorts of animals.

Method

Method of dying white cloth green, called Saxon green.

THE ordinary greens, ſtained blue in a woad vat, and afterwards yellow, in a bath of dyer's woad, are ſeldom uniform, almoſt always dull, and require ſeveral days labour to finiſh them intirely.—The green, dyed according to the new proceſs, of which the Saxons are believed to be the inventors, is, without compariſon, more freſh and lively; and, in four and twenty hours, one may dye ſeveral pieces of cloth, firſt blue, and then green, in the ſame copper. Altho' this green is not ſo ſolid, when tried inſtantaneouſly, as the common green; nevertheleſs, it reſiſts as much as theſe, both the action of the air, and the rays of the ſun; and its luſtre hath obtained it the preference over them, in England, Germany, and the Northern countries.—The firſt Saxon greens imported into the kingdom were purchaſed immediately, and the public, aſtoniſhed at their livelineſs, was deſirous that they ſhould be imitated in France. Their deſire was complied with, as ſoon as it was poſſible to learn the baſis of the proceſs; and thoſe who were charged with the execution have ſucceeded ſo much to their wiſh, that the laſt cloth which they dyed are, at leaſt, as pretty as the fineſt greens brought from Saxony.

The

The foundation of this green is a blue, extracted from indigo by the acid of vitriol: it is covered with a yellow, extracted from real yellow woad, from dyer's weed, or from any other ingredient, which gives a yellow of a good tint: but the ſucceſs of the proceſs depends upon the choice of the acid, known in trade by the appellation of *oil of vitriol*; and alſo upon the equal diſtribution of the ſame acid, when it is incorporated with the blue of indigo in the copper, where the cloth is to be dyed firſt a lively ſhining blue, and afterwards a yellow, which is to be changed into a green.

If the oil of vitriol is weakened by a too great quantity of aqueous particles, it doth not attack the beſt indigo, or, at leaſt, extracts from it but an ugly grey.

If the indigo blue, extracted by a concentrated, or very acid oil of vitriol, is not equally diſtributed in the bath of the copper; as this liquor is much heavier than water, it is precipitated to the bottom by its own gravity: in this caſe, the cloth dipt in the bath imbibes the blue unequally, and appears variouſly ſhaded. It takes indeed the green colour in the bath of yellow; but that green is alſo differently ſhaded.

In

In publiſhing the proceſs of a Saxon green, we thought proper to begin with informing dyers with the method of preventing theſe defects. The common oil of vitriol, which is bought of druggiſts, or brought from Hamburgh or Holland, muſt be concentrated by diſtillation. But this operation is difficult for a dyer, who is not ſuppoſed capable of conducting a diſtillation by a retort. Now it is required to have the oil of vitriol with the feweſt aqueous particles poſſible; theſe may be expelled by a ſand-fire, ſtrong enough to make them evaporate into ſmoke or vapour. When the oil of vitriol ceaſes to ſmoke with the ſame degree of heat, it is a ſure ſign that it is concentrated, or acid enough to extract the blue colour from indigo, and conſequently to make what is called in the proceſs the *compoſition*. This evaporation is performed in a glaſs pot without a funnel, better than in any other veſſel: where that is wanting, a well-burnt ſtone pot may be uſed, provided it is not porous; or, finally, an earthen pot well varniſhed, which, however, is not ſo proper for that operation, as either thoſe of ſtone or of glaſs.

This veſſel, of glaſs, of ſtone, or of varniſhed earth, is to be placed upon an iron pan, half, or two thirds, full of fine ſand, which ought to be well dried before.—This iron pan muſt be put upon a ſtove, with a grate, and an aſh-pán under

it,

it, and the bed of ſand muſt be gradually heated with a charcoal fire, that the glaſs, ſtone, or earthen pot may likewiſe be heated by degrees, and not be in danger of cracking, which would certainly be the caſe, if it was warmed too quickly.

As ſoon as the oil of vitriol emits no more aqueous vapours, the acid begins to evaporate: it is eaſily judged if the vapour is acid by holding a piece of blue paper ſtretched over it: if the paper becomes red almoſt inſtantaneouſly, the liquor is ſufficiently evaporated: allow it then to cool, till it be lukewarm, by taking the pot off the hot ſand, and placing it upon ſtraw at a ſmall diſtance from the ſtone, that the contiguous air may be dry: for, was it placed in a moiſt air, the oil of vitriol would re-imbibe the aqueous humidity, which it loſt by evaporation.—This liquor, being thus cooled, ſo as to be hardly lukewarm, muſt be poured upon the quantity of indigo, which ſhall be afterward preſcribed.—The indigo, however, muſt be beforehand reduced to a powder, and put into a glaſs or ſtone veſſel, which ſhould be well ſtopt with a cork, with wax round it, leſt the oil of vitriol, after diſſolving the indigo, which is then called the *compoſition of blue*, ſhould re-attract the moiſture of the air.

In fine, if you would be abſolutely certain that the oil of vitriol is concentrated enough not to fail

fail in forming this *compoſition*; you have only to pour two ounces of it upon forty or fifty grains of pulverized indigo, put into a vial, and to mix them well by ſhaking the vial: in an hour's time, the liquor which floats above the ſediment, ſhould be of a fine dark blue: if it is only grey, the oil of vitriol is not enough concentrated.

Proceſs for dying a piece of cloth, twenty ells long, into a Saxon green.

DISSOLVE in a ſufficient quantity of river-water, which breaks ſoap perfectly well, three pounds and a half of Roman allum, and two pounds of the powder of white tartar: boil the cloth in it half an hour, or five and thirty minutes at moſt: take it out and expoſe it to the air to cool, but do not waſh it.

Refreſh the bath of this *boiler* with twenty or five and twenty buckets full of water, and throw in, at two different times, the *compoſition of blue*, deſigned for the cloth. If the oil of vitriol has concentrated, or has ſtood the proof which we ſhewed above, it is ſufficient to take a pound and an half, and pour it lukewarm upon two ounces and an half of fine powder of indigo. You muſt wait till the diſſolution is made, and the liquor becomes a fine dark blue: but if this *compoſition of blue* has been made ſome days before, ſo much

the

the better; for then you may take one pound ten ounces, or a little more, and pour the half of it into a pretty large ſtone pot, or into a bucket, proper for the uſe, into which there muſt be put before, ten or twelve pints of the refreſhed bath from the boiler. The whole muſt be well jumbled, in order to diffuſe the compoſition of blue. You muſt likewiſe have a ſtraining bag of cloth, ſteep it well in the bath of the boiler, open it, and pour into it that half of the compoſition which is already mixt. By this means you will preſerve the ſtraining-bag, which, without this precaution, would have been burnt by the oil of vitriol, if it had been poured in as much concentrated as at firſt.

Put the ſtraining-bag over the whole extent of the bath, that it may imbibe the blue equally: palliate likewiſe the bath, that the diſtribution of the colouring particles may be more equal: when the cloth is cooled, let it down into the cauldron, and keep it there five or ſix minutes without boiling, turning it rapidly, and agitating the bath with a pole of white woad. Then take out the cloth, raiſing it only upon the turn.

Put the ſtraining-bag again into the ſame bath, and throw in the other half of the compoſition of blue, after it has been diſſolved as the former half, in ten or twelve pints of water taken from the boiler. Paſs the ſtraining-bag over the bath, as

as formerly, palliate it ſtrongly, let down the cloth, and turn it three or four times very quickly, in continuing to agitate the bath with the ſtick: in fine, in order to make the colour even, boil the bath of blue very gently, and turn the cloth in it ſlowly for ſeven or eight minutes. Take it out ſtained blue, and let it cool.

Empty this boiler of three-fourths of its contents, and as many buckets full as you take out of the blue bath, pour in the like number of the yellow bath, deſcribed below.

In order to make the yellow bath, you muſt heat gradually another boiler, into which muſt be put a ſufficient quantity of pure river-water, with a bag of new coarſe cloth, containing from ten to twelve pounds of real yellow woad (not fuſtic) cut into chips.—When this bath has been heated by degrees till it boil, you muſt let it boil two full hours.—Yellow woad, cut into chips, ſucceeds better than when it is ground; in this caſe, eight pounds are ſufficient for a piece of cloth of twenty ells; but there is a great riſque of uſing it adulterated.

After you have poured into the firſt boiler when the blue was made, the quantity of the yellow bath, preſcribed above, or even a greater number of buckets full, according to the ſhade of green required; the blue cloth, which ought

to

to be ſufficiently cooled, muſt be let down into this new bath, when very hot; and ſtirred about till you have the ſhade of green you want: then take out the cloth, cool it by expoſing it to the air, waſh it, lay the nap, dry it on the tenter-hooks, bruſh it, as ſcarlet is bruſhed, and afterwards preſs it, but in this operation, let it be as cool as poſſible.

If you have ſeveral pieces of blue cloth to be dyed green ſucceſſively, you muſt take from the bath, which dyed the preceding piece blue, as many buckets full as are to be added from the yellow bath to dye the blue cloth into a green; which will amount to twenty buckets full, or thereabouts, to be taken out, and twenty to be ſupplied; by theſe means the ſhades of green are rendered more equal and uniform.

The Saxon green of that cloth, which hath been firſt dyed blue in a bath compoſed of allum and white tartar, is much more ſolid than of that which is ſtained blue in a new bath of plain water, without theſe ſalts; but it has not ſo good a luſtre. However, as it reſiſts the rays of the ſun for twelve days, it may be reputed a very good tint. Being made by means of an acid, it muſt not be proved by ſoap, which is preſcribed for the ordinary greens made in the blue vat.—In order to prove it, you ſhould boil it for five minutes

nutes in a quart of water, with two drachms of Roman allum, as ſcarlet is tried, what is alſo dyed with an acid: if it preſerves its colour, it may be reckoned a very good tint, although by this operation it loſes much more than in the rays of the ſun.

A TABLE, ſhewing the value of the current money of France, at twenty-four ſeveral periods, from Charlemagne to the preſent time.

Reigns.	Dates.		liv.	fol.	den.
Charlemagne from	768	to 1113	66	8	0
Louis VI. VII.	1113	1158	18	13	6
Philip Auguſtus	1158	1222	19	18	4 4/5
St. Louis and Philip the Hardy	1222	1226	18	4	11
Philip the Fair	1226	1285	17	19	0
Louis Hutin and Philip the Long	1285	1313	18	8	10
Charles the Fair	1313	1321	17	3	7
Philip of Valois	1321	1344	14	11	10
King John	1344	1364	9	19	2 2/3
Charles V.	1364	1380	9	9	8
Charles VI.	1380	1422	7	2	3
Charles VII.	1422	1461	5	13	9
Louis XI.	1461	1483	4	19	7
Charles VIII.	1483	1497	4	10	7
Louis XII.	1497	1514	3	19	8
Francis I.	1514	1546	3	11	2
Hen. II. and Fra. II.	1546	1559	3	6	4 4/5
Charles IX.	1559	1574	2	18	7
Henry III.	1574	1589	2	12	11
Henry IV.	1589	1611	2	8	0
Louis XIII.	1611	1642	1	15	3
Louis XIV.	1642	1715	1	4	11
Louis XV.	1715	1720	0	8	0
Preſent Livre	ſince	1720	1	0	0

The

The French livre owes its inſtitution and diviſions to Charlemagne, who firſt ordered a livre, or pound, of ſilver, to be cut into twenty pieces, called *ſols*; and each of theſe ſols into twelve pieces, called *deniers*. In Charlemagne's time, then, the livre was a real pound weight of ſilver; which was the roman pound of twelve ounces, equal to about ten ounces and three quarters of Paris. But, after that time, the livre, inſtead of a real pound weight, became nominal and numerary, its value greatly decreaſing, and a pound of ſilver containing a great many nominal pounds or livres.

When hiſtorians are obliged to ſpecify the ſums which princes employ in their enterpriſes, or ſtipulate to pay by treaty, or raiſe by contribution, &c. they expreſs themſelves according to the rate of money at the time of the event they ſpeak of: but the alteration in the value of money at different periods throws an inevitable obſcurity on this part of their ſtory. The utility therefore of this table in the reading of hiſtory is moſt apparent. For example: we are told, that Charles the Bald, emperor and king, who reigned from the year 840 to 877, finding himſelf too weak to drive out the Normans (who had come up the Seine, and ravaged the country about Paris) by force of arms, concluded a treaty with them, in which it was ſtipulated, that 7000

livres of ſilver ſhould be given them to retire. Now it appears by the table, that from 840 to 877, the time of this prince's reign, the livre was a real pound of ſilver equal to 66 livres 8 ſols of the preſent money. Therefore 7000 pounds, multiplied by 66 livres 8 ſols, give the value of Charles's gift to the Normans, viz. 465,000 livres.

By this table we alſo find that Charlemagne, with a revenue of one million, was as rich as Lewis XV. with one of ſixty-ſix millions.

A TABLE

A TABLE of the EXCHANGES between Paris and the principal towns of Europe; ſhewing, at one view, whether the balance of trade be for or againſt France. The mark, or 8 ounces, of coined ſilver being reckoned at 27 and at 50 livres.

	The mark of ſilver at 27 livres.	The mark of ſilver at 50 livres.
Paris; the French crown being valued at 3 livres.		
Amſterdam; books are kept, and bills are drawn, in livres, ſols, and deniers de gros; and in florins of 40 deniers de gros,	100	54
Antwerp; books are kept, and bills are drawn, in livres, ſols, and deniers de gros, and in florins of 40 deniers de gros,	96	51 $\frac{23}{25}$
Cologn; books are kept, and bills are drawn, in rixdollars of 78 albus, the albus conſiſting of 12 deniers,	78	42 $1\frac{11}{22}$
Copenhagen; books are kept, and bills are drawn, in rixdollars of 4 orts, the ort conſiſting of 18 ſhillings,	4	2 $2\frac{22}{25}$
Dantzick; books are kept, and bills are drawn, in rixdollars of 90 gros, or in florins of 30 gros,	90	48 $\frac{3}{5}$

Florence;

	The mark of ſilver at 27 livres.	The mark of ſilver at 50 livres.
Florence; books are kept, and bills are drawn, in livres, ſols, and deniers, and in ducats of 7 livres 10 ſols,	6	3 4 9
Francfort; books are kept, and bills are drawn, in florins of 60 kreuts, and in rixdollars of 90 kreuts,	90	48 $\frac{3}{5}$
Genoa; books are kept in livres, ſols, and deniers; and bills are drawn in piaſtres of 95 ſols,	4 16	2 11 10
Hamburg; books are kept in marks, ſols, and denier lubs; and bills drawn in rixdollars of 48 ſols lubs,	48	25 11 $\frac{1}{25}$
Leipſic; books are kept, and bills are drawn, in rixdollars of 24 groſchen, the groſchen conſiſting of 12 deniers,	24	12 11 $\frac{13}{25}$
Liege; books are kept, and bills are drawn, in livres, ſols, and deniers, 20 ſols = 1 liv. 12 den. = 1 ſol.	4	2 3 2
Liſbon; books are kept, and bills are drawn, in real, 400 of which make a cruſado not marked,	600	324
Leghorn; books are kept in livres, ſols, and deniers; and bills are drawn in piaſtres of 6 livres,	6	3 4 9

London;

	The mark of ſilver at 27 livres.	The mark of ſilver at 50 livres.
London; books are kept, and bills are drawn, in pounds, ſhillings, and pence, ſterling, twenty ſhillings being equal to one pound, and twelve pence to one ſhilling,	54	29 $\frac{4}{29}$
Madrid; books are kept, and bills are drawn, in maravedis, in ducats, in reas, in reals, and in piſtoles,	160 $\frac{3}{11}$	296 $\frac{2}{11}$
Meſſina; books are kept in ounces, taris, grains, and picolies; and bills drawn in ducats of 10 carlins,	9	4 8 $\frac{1}{5}$
Milan; books are kept in livres, ſols, and deniers; and bills are drawn in crowns,	4 14	2 10 9
Naples; books are kept, and bills are drawn, in ducats, taris, and grains; five taris being equal to one ducat, and twenty grains to one tarin,	4 10	2 8 $\frac{1}{5}$
Rome; books are kept, and bills are drawn, in Eſtempi crowns of 15 $\frac{1}{2}$ julios, equal in value to one half piſt,	8 2	4 4 1
Stockholm; books are kept in daalders, marks, and orts; and bills are drawn in copper rixdollars of 24 marks,	24	12 $\frac{24}{25}$

Turin;

	The mark of ſilver at 27 livres.	The mark of ſilver at 50 livres.
Turin; books are kept, and bills are drawn in livres, ſols, and deniers; 3 livres 15 ſols making a crown, of 9 to the mark,	3 15	2 6
Venice; books are kept, and bills are drawn, in ducats of 20 ſols, the ſol of 12 deniers,	24 7	12 11

EXPLANATION.

The French crown of $8\frac{1}{12}$ to the mark, coined in 1641, has always ſerved for the foundation of the exchange between France and the principal towns of Europe; and has been received in Holland upon a par with 100 deniers de gros; the laws of that republic having fixed the mark of ſilver of France, and other counties, at 22 florins 10 ſols, which anſwer to 900 deniers de gros, 40 of which make a florin of exchange.

When the mark of coined ſilver in France was worth only 27 livres, a crown of 60 ſols, being the ninth part thereof, was in exact proportion to 100 deniers de gros in Holland. But the ſame weight of ſilver being in 1754 worth 50 livres, and containing $16\frac{2}{3}$ crowns, each crown is worth only 54 deniers de gros.

The

The firſt column of the table contains the names of the principal trading cities in Europe, the manner in which books are there kept, and their money of exchange.

The ſecond column exhibits the value of the French crown of three livres in the money of each reſpective city, when the mark, or 8 ounces of ſilver in France was at 27 livres. For example: at Amſterdam it was worth 100 deniers de gros; at Antwerp 96; at Cologn 78 albus; and ſo on. This column alſo ſhews the reſpective equality, or reciprocal parities, of foreign monies.

The third column gives us, in like manner, the value of the French crown of three livres when the mark of French ſilver is at fifty livres.

To know whether the balance of trade with any other ſtate be for or againſt France, we need only caſt an eye on this table. If the courſe of exchange be above the par expreſſed therein, the balance is in favour of France; if under the par, it is againſt her. For example: the par of a French crown of 60 ſols (the mark being at 50 livres) is 54 deniers de gros at Amſterdam; and the courſe of exchange being at $56\frac{1}{4}$, which is the par of 48 livres the mark, it is evident that France gains the difference between 54 and $56\frac{1}{4}$ in the detail; and, with regard to the mark, the difference between 50 and 48. France therefore gains two

gra-

gradations, which, at 20 ſols in the mark, makes four per cent. at two uſances, eight per cent. at four uſances, and ſo on.

When the balance of trade with France is againſt Holland, or any other country of Europe, it is owing to their having taken more goods from France, than France took from them. From 1664 to 1725 the courſe of exchange with the other ſtates of Europe was always to the diſadvantage of France, as they ſupplied her with more goods than they took from her: but ſince 1726, when the trade of the French Eaſt-India company began to counterbalance that of the Engliſh and Dutch, the courſe of exchange has always been in favour of France.

A TABLE

A TABLE, ſhewing in French money of accompt, the money of exchange of different cities in Europe; reckoning the mark of ſilver, or 8 ounces, at 27 livres, and at 50 livres.

	Liv.			Liv.		
The price of the mark of ſilver at Paris being	27			50		
The florin of Amſterdam	1	4		2	4	5
Florin of Antwerp	1	5		2	6	3
Rixdollar of Cologne	3			5	11	1
Rixdollar of Copenhagen	3			5	11	1
Rixdollar of Dantzick	3			5	11	1
The Florence crown	3	15		6	18	9
Rixdollar of Francfort	3			5	11	1
Piaſtre of Genoa	3			5	11	1
Rixdollar of Hamburg	3			5	11	1
Rixdollar of Leipſic	3			5	11	1
The Liege crown	3			5	11	1
Cruſada of Liſbon	2			3	14	
Piaſtre of Leghorn	3			5	11	1
The London pound ſterling	13	6	8	24	13	9
Piſtole of Madrid	11			20	7	4
Ducat of Meſſina	3			5	11	1
Ducaton of Milan	3	13	4	6	15	9
Ducat of Naples	3	6	8	6		9
Eſtempe Ecu of Rome	5	10		10	3	8
Rixdollar of Stockholm	3			5	11	1
Ecu of Turin	3			5	11	1
Ducat of Venice	2	10		4	2	7

An

An Account of the BAPTISMS, MARRIAGES, and DEATHS, in the City and Suburbs of PARIS, in the year 1750.

Pariſhes.	Baptiſms. Boys.	Girls.	Mar-riag.	Deaths. Mal.	Fem.
St. Sulpice	1127	1143	573	717	782
St. Euſtathius	1046	962	518	573	578
St. Margarite, in the ſuburbs of St. Anthony,	676	662	309	493	429
St. Nicolas in the Fields	651	600	330	348	399
St. Lawrence	634	541	252	387	348
St. Germains l'Auxerrois	478	448	257	354	379
St. Paul's	364	339	224	271	304
St. Stephen of the Mount	365	326	159	241	231
St. Roch	339	307	182	206	193
St. Gervais	279	271	165	191	191
St. Medard	207	190	131	155	154
St. Severin	200	224	120	121	138
St. Saviour	228	193	104	131	132
St. James of the Butchery	215	240	110	108	120
St. John of the Greve	167	183	104	113	115
St. Mederick	204	185	96	94	114
Magdalene of Ville Evegue	166	172	91	93	105

St.

Pariſhes.	Baptiſms. Boys.	Girls.	Mar-riag.	Deaths. Mal.	Fem.
St. Nicolas of Chardonnet	135	127	56	95	10.
St. Benedict	139	126	79	88	9-
Our Lady of Bonnes Nouvells at Ville Neuve	137	144	74	69	67
St. James of Hautpas	105	108	57	85	89
Our Lady of good deliverance at Gros Caillon	93	84	32	62	63
St. Bartholemew	74	89	49	54	43
Chaillot	81	52	29	51	53
St. Magdalene	69	63	37	34	31
St. Come	26	54	31	40	35
St. Andrew	127	103	64	82	81
St. Leu and St. Giles	109	99	60	49	55
St. Hypolite	90	101	43	61	62
St. Lewis in the iſland	67	74	52	52	48
St. Martin, ſuburbs St. Marceau	67	69	35	51	41
	8665	8179	4423	5469	5576

BIRTHS,

Births, Marriages, and Deaths, at Paris, in the year 1750.

Pariſhes.	Births. Boys.	Girls.	Mar-riag.	Deaths. Mal.	Fem.
St. Germans le Vieïl	42	51	17	11	35
St. Peter des Arcis	37	22	17	16	25
St. John the Baptiſt of Belle Ville	34	23	16	23	16
The Temple	25	26	13	20	16
St. Hillary	18	31	9	12	22
St. Philip du Roule	27	18	14	27	18
St. Landry	23	12	14	14	12
St. John de Latran	14	22	4	12	9
The Chapel of St. Dionyſius	13	22	7	10	16
Sainte Croix of the Citadel	19	13	4	7	6
The Holy Innocents	13	18	11	10	11
St. Joſſe	19	8	3	3	2
St. Opportune	11	15	7	6	3
Baſſe Chapelle of the palace	10	8	2	5	9
The Holy Sepulchre				1	
St. Peter aux Bœufs	7	12	12	6	5
St. James de la Villette	6	8	6	4	2
St. Simphorien				19	14
Sts. Dionyſius, and John the Baptiſt,				1	3
Of our Lady,	4	6	4	1	6

St,

Pariſhes.	Births. Boys.	Girls.	Mar-riag.	Deaths. Mal.	Fem.
St. James de l'Hoſpital	4	3	2	6	3
St. Lewis of the Invalids	5	3	2	512	
Ste. Marine	1	4	4	6	6
St. Lewis of the Louvre	4		4	1	
St. Honorius of the Cloiſter		3	1	2	
St. Victor Clos	1	1	1		
College of Cardinal Moine	1		2		
	338	329	173	735	239

Hoſpitals.	Births. Boys.	Girls.	Mar-riag.	Deaths. Mal.	Fem.
Hotel Dieu	665	666		2811	1648
Bicêtre	13	21		257	39
La Saltpetriere	7	5	4	126	389
Foundling Hoſpital, ſuburbs St. Anthony				139	91
Les Quinze vingts	26	26	12	17	18
The Charity				320	
The Pity				13	3
St. Lewis					16
Les Hoſpitalieres de la Raquette				18	22
The Incurables					

5

Les

Hoſpitals.	Births. Boys.	Girls.	Marriag.	Deaths. Mal.	Fem.
Les Petits Maiſons (Mad Houſes)				14	37
The Trinity				5	3
The Holy Ghoſt				3	1
All the Religious Houſes				70	101
Religionaires inhabitants of Paris, buried in the Timber yards,				24	14
Religionaires ſtrangers				24	5
	711	718	16	3841	2387

BIRTHS.

	Boys.	Girls.	Marriages.
Total	9714	9226	4612

DEATHS.

Males.	Females.
10045	8202

Exceſs of the Births 834.

Received into the Foundling Hoſpital 1943 Boys, and 1842 Girls.

BIRTHS,

BIRTHS, MARRIAGES, and DEATHS, in the City of PARIS, and its Suburbs, in the year 1751.

Pariſhes.	Births. Boys.	Girls.	Marriag.	Deaths. Mal.	Fem.
St. Sulpice	1200	1135	636	617	674
St. Euſtathius	1021	933	583	509	559
St. Margarite, in the ſuburbs of St. Anthony,	726	678	326	484	438
St. Nicolas of the Fields	690	606	359	359	396
St. Lawrence	568	582	288	300	325
St. Germans l'Auxerrois	490	436	253	249	238
St. Paul	420	396	215	221	266
St. Stephen of the Mount	351	334	182	186	236
St. Roch	315	318	196	166	183
St. Gervais	277	287	189	194	186
St. Medard	214	212	101	125	141
St. Severin	210	204	121	105	115
St. Saviour	211	237	119	104	132
St. James of the Butchery	244	195	103	91	102
St. John in the Grêve	225	183	102	120	124
St. Méri	198	201	137	113	117
The Magdalene of Ville Evêgne	171	165	88	103	83
St. Nicolas du Chardonnet	131	135	73	99	99

Parishes.	Births. Boys.	Girls.	Marriag.	Deaths. Mal.	Fem.
St. Benedict	120	126	80	69	81
Our Lady of Good News at Ville Neuve	131	133	79	49	72
St. James of Haut-pas	126	100	62	74	87
St. Andrew	103	112	74	55	67
St. Leu and St. Giles	110	107	77	56	63
St. Hypolite	16	92	39	61	54
Our Lady of Good Deliverance au Gros Caillon	94	91	32	61	64
St. Bartholemew	101	90	46	34	49
St. Lewis of the Island	77	76	65	47	36
St. Martin, fuburb of St. Marcellus	77	64	42	48	38
St. Peter de Chaillot	65	53	23	48	41
St. Magdalene	74	62	29	33	31
St. Come	44	50	38	18	30
St. Germans le Vieil	54	45	21	17	21
St. Peter des Arcis	24	24	22	22	18
St. John the Baptift of Belle Ville	29	33	15	11	27
The Temple	28	29	16	7	13
St. Hillary	24	27	20	9	10
St. Philip du Roule	29	25	18	17	19
St. Landry	24	22	20	5	8
St. John de Latran	17	19	9	9	13
The Chapel of St. Dionyfius	17	12	5	13	9

Ste.

Parishes.	Births. Boys.	Girls.	Marriag.	Deaths. Mal.	Fem.
Ste. Croix of the Citadel	8	18	9	8	6
The Holy Innocents	17	16	18	11	20
St. Joffe	6	14	4	3	7
Ste. Opportune	6	10	7	3	8
Baffe Chapelle of the palace	3	8	7	6	3
The Holy Sepulcher		1		1	1
St. Peter aux bœufs	5	12	17	5	2
St. James de la Villette	11	3	2	4	5
St. Simphorien				15	7
St. Dionyfius and St. John the Baptift of our Lady	6	5	15	6	3
St. James of the Hofpital	1	2	2	5	6
St. Lewis of the Invalids	2	6		561	7
Ste. Marine	2	2	4	2	2
St. Lewis of the Louvre	3	2	1	1	1
St. Honorius of the Cloifter	1	4	2	2	3
St. Victor Clos			3	2	
College of Cardinal Moine			6	1	2

Hoſpitals.	Births. Boys.	Girls.	Marriag.	Deaths. Mal.	Fem.
Hotel Dieu	704	661		2350	1680
Bicêtre	10	8		199	26
La Saltpetrière	2	4	4	103	425
Foundling Hoſpital, ſuburbs of St. Anthony				115	118
Les Quinze Vingts	23	26	13	18	26
The Charity				294	
La Pitié	9			19	5
St. Louis					
Les Hoſpitalieres de la Raquette					16
The Incurables				38	32
The Mad Houſes				14	51
The Trinity				2	1
The Holy Ghoſt				7	1
All the Religious Houſes				68	117
Religionaires inhabitants of Paris, buried in timber-yards,				12	12
Religion. ſtrangers				18	2
	9925	9431	5017	8801	7860

Exceſs of the Births 2695.

Received into the Foundling Hoſpital 1922 Boys, and 1861 Girls.

FINIS.