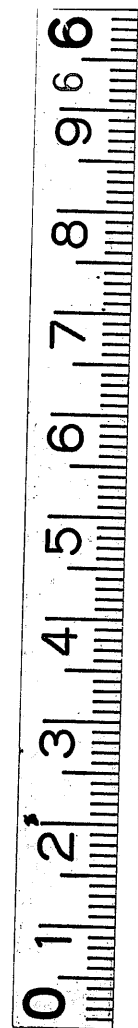


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SELECT
E S S A Y S
ON
COMMERCE, MINES,
AGRICULTURE, FISHERIES,
AND OTHER
USEFUL SUBJECTS.

Felix, qui potuit rerum cognoscere causas.

VIRG.



L O N D O N :
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MDCCLIV.

T H E
P R E F A C E.

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 agriculture;

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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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M E M O R I A L

Concerning the

C O M M E R C E O F R U S S I A.

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 indispensable: 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

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as those of the Vandals, Poles and Bohemians, are simple dialects of the Slavonian, 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 Oldenburg 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 Soctoslo, 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.

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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

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the twelfth, thirteenth, and 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 Moscow, Basilus Basiloritz, surnamed 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 Pefora, in order to discover silver mines.

Several other strangers were called to Moscow, under his son Basilus 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 Moscow 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

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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 Magnus,

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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

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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

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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.

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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-Narifkin, and the direction of his governor old Galiezin, 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

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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

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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 Petersburg. 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 tariff 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-

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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 fortresses 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 Ibrand, 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 Peking 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

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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
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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. Peterburgh: 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

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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-

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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,

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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^l 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

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

The commerce of Asia, comprehends that of Turkey, Persia, Siberia and China. The trade with the Turks is but trifling, carried on by the Cossacks in small botlers upon the Don, and the sea of Azoph, between the Ukraine and the Crimea; the most considerable part being transacted from the city of Tzercaikoi, to Caffa, and consisting chiefly in furs, beaver, Turkey 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 Turkey; 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 Turkey, with respect to the Russians. The Tartars carry it on in small botlers, 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.

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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 Turkey 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 Timuferwitz, 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 defarts. He warred with all the Tartars whom he met in this expedition, and easily subdued them, as well by the advantage

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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 solicit 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,

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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

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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 *Siberiski-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 Turkey. 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 *Siberiski-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

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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. Petersburg. 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 Pustofero, 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 considerable

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 Petersburg, 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.

	<u>1744</u>	<u>1745</u>
From Denmark - -	12	18
From England - -	115	69
From Holland - -	61	32
From Lubec - -	29	31
From Sweden - -	15	9
From Raftok - -	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 - -	<u>264</u>	<u>195</u>

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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.

	<u>1744</u> roubles.	<u>1745</u> roubles.
In vegetables -	2156026	1262269
Animals -	1450234	1414398
Minerals -	140610	128595
Total	<u>3746870</u>	<u>2805262</u>

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
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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
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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 inconveniences; 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,

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

But, on the other side, we must observe, that granting these inconveniences 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 conveniences of life; as on their side they will always 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, Poustosero 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.

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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 conveniences 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, Lyvonian, 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

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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.

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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 goodwill 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 ;

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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 Petersburg 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 Ruffia 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 Ruffia, 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 Ruffia, 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 Ruffia: 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.

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A C C O U N T
O F T H E
C O M M E R C E
O F
D E N M A R K.

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

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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 antiently 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,

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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

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the society, and its department comprehended all the cities of the Venidians and of Pomerania, which had been admitted into the alliance. Cologne was the quarter-town of the second class, comprehending the associates of the country of Cleves, Lamarck, Westphalia, Guelderland and Overysfel. 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 Townhouse, and then asked pardon on their knees. Dantzick was at the head of the fourth class, which comprehended the cities of Ruffia 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

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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

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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 Hanseaticques, 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
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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 Hamburgers 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
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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, especially 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 originals, and give copies of them to the ambassadors 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 Odensec 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.

TheHamburghers, 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 authorized 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.

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This they rigorously exercised, and likewise prohibited the inhabitants of Holface, 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

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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 Hamburgers 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 Hamburgers opposed him more briskly than ever, having fitted out a ship of war that obliged all vessels laden with corn to go to Hamburg.

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 Hamburgers paid to the King forty thousand livres, promised to give no cause for such disputes for the future,

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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 Hamburg 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 Holface, 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 Hamburgers should no longer fix a price upon the merchandize belonging to the inhabitants of Royal and Ducal Holface, but that these last should be at liberty to make their own markets with the purchaser.

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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
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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
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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 acquitted 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

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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 while 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.

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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*,

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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.

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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
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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 complete 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

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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 Antwarfchau 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

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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

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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

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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,

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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 subsistence. 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 Naicke or King of Tranfiour; 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 Tranfiour, 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-

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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 Tanfiour is but a petty King; his whole country being but about sixty leagues in length; his capital is Tanfiour, 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 manner

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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 lay

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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

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livered without the assistance of a glyster administered 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 merchandize 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-

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productions 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.

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The second reserves to the King the property of the fort of Dansbourg, and the fortrefs of Tranquebar; but allows the company to choofe, 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 administered 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 fortrefs 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 Tanfour.

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

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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

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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 publicly 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-

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pany's bank ; that the strangers should deposit their's in the bank of Hamburg, 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 re-establish 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,
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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 Friedreichsberg 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

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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

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had founded it. Being new re-instated in their antient rights, the Swedes gave the government of that place to Anthony Vost of Hamburg; 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 Frederickberg; 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
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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
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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 Barfiar. 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
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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 assaying, are very often deceived.

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

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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
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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
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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

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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 Peterfon Lerck, and John Nansen. They beseech 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 Brandenburg had a mind to embark in the trade of the company. It was with this design that some Brandenburgers went to settle at St. Thomas; but
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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 Brandenburg, proposed to prolong the term; but as the Brandenburgers already owed a considerable sum to the Danes, and there was no appearance of the company's being reimbursed, they rejected those proposals, 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

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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

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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
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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 number 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-

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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
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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 displeas'd 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 appeas'd, 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.

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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,

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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 Holstene, 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

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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
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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

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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 surpris'd 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

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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.

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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-

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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,
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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 forcery and enchantments, of which they are very fond. Nevertheless, without any theory, they practise several virtues, a circumstance not more inconceivable 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

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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 $66^{\circ} 30'$. 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 profelytes, 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

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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.

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The trade of Iceland did not cost so much pains in establishing. The Dutch, the Hamburgers, 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.

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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 petrifications. 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

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real fugar, 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 crowds 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 Rosetenna, 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
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faulcons of Iceland are in great reputation, When the inhabitants catch them, they are carried to the King's falconers, who, in proportion to the beauty of each bird, pay from five to fifteen rix-dollars; as to the white falcons, 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 falcons, 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
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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.

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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

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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, artificers 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

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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

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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

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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

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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
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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
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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,

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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 indispensable 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 Pyrrhology, 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.

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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

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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

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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.

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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

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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 dearth 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
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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 artificers 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 deposits 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 risk of the
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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
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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.

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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

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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

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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.

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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
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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
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it is attended with no inconvenience in strong ground, which ought to be well turned up; but the whole labour would be lost in light 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 light 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.

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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

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 con-

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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

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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 chestnut-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
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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 philosophy.

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fophy. If the different beings which the earth produces and maintains, if the vegetables now in question, 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 feeds; 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
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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
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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

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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

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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 critic 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-

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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

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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 complete 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 feed, the alteration it would
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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 feeds, 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
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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,

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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,

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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.

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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.

As's 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

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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.

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Pork

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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.

F A T T E N E R S.

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,

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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

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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,

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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-

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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,

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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-

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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

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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

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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 flake 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

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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.

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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 surprizing 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

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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.

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

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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

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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,

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virtue, than the vine; therefore, the lees which the wine deposits 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,
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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

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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

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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

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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

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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

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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
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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-

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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

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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.

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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 height 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

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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 brushwood, 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.

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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 surrounded 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 humidity,

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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:

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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

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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

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Of H O P S.

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

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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 wholesome, 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

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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.

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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,

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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 height, 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 stripped 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

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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, burfa pastoris, two kinds of which are described

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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 burfa 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
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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
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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

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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

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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 feed.

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

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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 Ve- getation 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

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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 surpris'd 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.

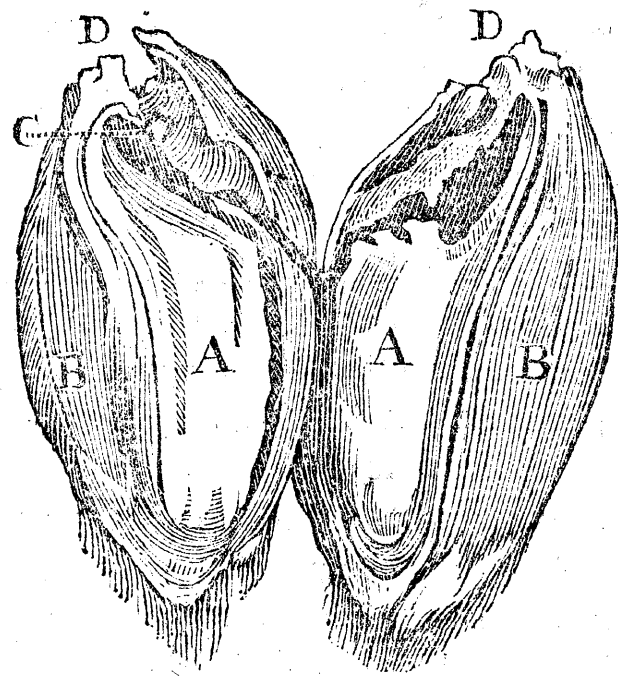
The farinous substance is composed of small vesicles, or bladders, and being moistened in the earth, serves for nourishment to the shoot, until three green leaves appear, at which period it begins to draw its nourishing juice by the root. As this moistened farina, or meal, affords the first nourishment,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

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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.

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A. The farinous matter. B. The first of the pellicles that envelop 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 feeds 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

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the conduits are broken or obstructed, the said shoot cannot possibly thrive. But when the eye that confines it, is found 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

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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 brownish 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, spongy matter, which is to be
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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

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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,

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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 inconceivable 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

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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 perceivable 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 dusky 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 ferruginous 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,

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foil, 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 preciously 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

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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

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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
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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,
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confists 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

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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

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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 surpris'd 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-

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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 aqueosity 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 stripped off before winter, for the nourishment of silk worms.

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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.

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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

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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 wainscoting 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.

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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 herein 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.

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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 Spere, 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 Spere: 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
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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

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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 fundry 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
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part of that which is bleached at Harlem, is cloth from Silesia and Overyffel, 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.

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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.

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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

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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

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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,

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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
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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 soaked 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

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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 fifteen 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 vi-

gorous,

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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 caught 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 always produced the desired effect.

The misfortune must be prevented at the time of planting. For an acre of ground take two ounces of assa foetida, 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.

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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

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

Of Affaetida	————	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; nor one of the vermin will approach it.

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RADISHES

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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.

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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 pack-thread: 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,

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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

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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 barrenness, 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

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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 wait until the husbandman shall pass a third time over the same ridge? Sure, this expedient would never come into his imagination.

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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

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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;

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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. Varenus relates, that the earth at Amsterdam, being dug to the depth of two hundred and thirty two feet, the beds or strata 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 Effois near Bar sur Sanne, April 26, 1751.

A

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 surprizing, 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

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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-mixing. The mixing of oats, is a mixture of one third of oats, with two thirds of peas and vetches, which is sown in March, on light 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

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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, indented in their edges, furnished with
stinging

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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,

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

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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 oeconomy, 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,

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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.

E S S A Y

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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,

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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 is likewise called forge-coal, because it is principally employed in casting

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or founding works. The slate-coal is of less value, the texture of it is brittle, and in form of layers. 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 forbear 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.

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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 explicit, 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,

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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 cliffs, 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

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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,

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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 phenomena 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, naphtha, petroleum, &c. the inflammable substance differs

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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

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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 Nordhausen, 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

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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

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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 *Epistola Itineraria* 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 aloae 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 kitchen 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 naphtha and petroleum ; but, when we consider that naphtha, which differs in nothing from petroleum, but in its purity and subtility, kindles so easily, at a

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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 kitchen 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 kitchen-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-

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wife all the officers of the forges would have swollen 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 resins. 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

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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.

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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

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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 surpris'd they have not imported and introduced that invention of D. Becher, which he has described in his work, entituled, *Folle Sageffe*,

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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

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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 silver 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

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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 be used 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 mineralifcantia*. 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
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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 mineralizing, 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 mineralizing 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 metallic 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 metallic 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 tinged 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

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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 likewise 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 kitchen-salt, which likewise contains an acid, mineralize metals?*

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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

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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;

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salt; whence it results, that kitchen-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 kitchen-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
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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 kitchen-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 kitchen-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 subtle 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

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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 kitchen-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 kitchen-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
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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 *Coffein*, 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
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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 unskillfully 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,

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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 kitchen-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 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 ac-

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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.

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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

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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

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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.

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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

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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 bufses 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.

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The reality of this estimate he demonstrated, first, by the number of bufses which then amounted to at least 1600. 2dly, By the quantity of fish taken by each buf. 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.

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in any other branch of commerce; that one buss bred at least ten failors; 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, fatten, 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

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which they do not consume themselves, and gives in exchange corn, wax, flax, hemp, pitch, coarse greafe, 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, millstones, 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

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barrels of herrings at twenty pounds sterling, the whole amounted to 5000000-l. Now, five millions sterling make fixty 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

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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.

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seeing Sweden is bounded by two great seas, through which the herrings pass in their annual 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

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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 enterprises, but cheese and butter. 4thly, Cannot we build buxses 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.

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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

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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 balance 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 increase 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 increased and its treasures accumulated. 11thly, Would Holland, which neither sows nor reaps be able by

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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

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Observations by MARTIN TYDELEK-
URSON 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 fund. 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, *baa*, and by the Germans, *bundfish*, which was taken in great quantities by the line, and transported in barks to Nylous in Sweden, where it was purchased by
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the Swedes, who from thence fold it all over the kingdom. They found this fish so delicious, that they called it *baa-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,

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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

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of the Dutch. In the alliance which in 1656 he made with England, during Cromwel's usurpation, there was stipulated a very advantageous 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 inhabitants 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

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"protect in a particular manner, the fishing company privileged by his majesty, against all the intrigues which evil-minded and envious persons 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 buffes 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

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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 entitled, *The art of making glass*, printed at Paris in the year 1697.

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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 knowledge, 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
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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 deserts 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.

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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 utterly 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

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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

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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.

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Letter

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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 Leipfick, 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

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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-imburfed 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,

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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-imbursment 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

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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, eighth, 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-imbursments

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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

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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.

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A Letter

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

SIR,

IN your journal for March, 1751, you have inserted a Differtation 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 solicitous, and laws too much extended or too minute, should happen to disturb particular manufactures, in terrifying by penalties often in-
judiciously

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 ge-
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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 knowledge 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?

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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
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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 knowledge 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 enlightened 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

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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
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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

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Memorial concerning the trade of the
republic of G E N O A.

TH E 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 dazzle 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 dissensions, 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

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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 whose country 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 knowledge 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
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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 surpris'd 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

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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 incontestable 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

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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 Marfeilles 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

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lic of Rome, which after having rebuilt and re-established 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

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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 succeeded him in the command of the army, happily achieved the enterprise, 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 knowledge 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

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Genoa having set herself at liberty, was greatly disturbed by the want of a title to independence, 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 independence.

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.

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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 Crusaders, 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 immovable root in divers countries. The service which the Genoese did the Crusaders, 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 Crusaders; and finally, to them was owing more than once the success of enterprises, 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
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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 Crusaders; 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
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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 factions and domestic dissensions, 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 marquises 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
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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 advantageous 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

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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 advantageous 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. Loricano, a Venetian by birth, in his excellent history of the kings of Cyprus of the house

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house of Lufignan, 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 threatened 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 galleys, with which they proposed to go and attack Ge-
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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 galleys, 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
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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 Portuguese, 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

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that there were some Genoese galleys 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 Pescara, 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

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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 advantageous 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 galleys 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 solicitations 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,

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Savona, which threatened 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 dissensions, 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

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was at sea, approached Genoa with thirteen galleys, 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, made 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 government.

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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 threatened 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 dissensions. 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

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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

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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

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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

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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 upon 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

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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 to 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 prince: 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 concurrence; 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 they

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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 allurements 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 deposit 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

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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 deposit his money. Every
action

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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
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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,

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fish, which for some time they sold along the coast, as far as Genoa on one side, and Marfeilles 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 chase; 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

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usury;

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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,

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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.

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Inquiry

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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

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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

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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
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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,

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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 Reaumur 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
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" 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,

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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,

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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 envelops the *regimen* of fruits before they are ripe, or that which sustains the young leaves: and in others they employed

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ployed the down which furrounds 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 *bakum*, 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 *bakum*, and *foribe*, 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 II, 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 phenomenon, 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

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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 synonymous 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 difference.

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
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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
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and less apt to rot in the water. This ought the more carefully to be examined, as the knowledge 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 *incomplete*, because these plants want the flower, or the *calix* or the *petale*, or both these parts.

Kempfer, in his catalogue of the plants of Japan, mentions one which in the Japanese idiom is called
white

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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 Japanese 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 *Lagetta*. 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

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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 *mabot* 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 *mabots* 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 *mabots*. 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

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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.

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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

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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

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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

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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

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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

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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 thought 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 entirely; 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, dogsbane, and trumpet-wood, which, though not so easily spun as cotton, seem to me susceptible of that

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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

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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

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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

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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 cottonaceous 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,

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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 Montpellier, 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

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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,

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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

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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
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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.

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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

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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,

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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 reason 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

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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 cottonaceous 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.

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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 that are 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

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situation.

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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 arctic 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

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the arctic 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.

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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

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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

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moses. Now, this moss being the ordinary food of the rein-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 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, entitled *Flora Laponica*. 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

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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 rein-deer from these heights, it is no other than a fable: but Linnæus describes circumstantially, the profound darkness which sometimes suddenly envelops 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

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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 Keckfiaware 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 Nafafael, 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, Ortafoiwe, &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

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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 amethyfts of a purple colour, topazes, loadstones, quicksilver and cinabar; 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

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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 rein-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,

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difficulty, 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
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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 Laplanders, 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 Ho-reavan, 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*, Skelleftra, 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

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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,

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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, atones 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.

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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 journeys, 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

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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 knowledge 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 *Passe-ware*; 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 frightened,

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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 knowledge 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

E e 4 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 browsing upon that which sticks to the trees, without digging beneath the snow, he takes it

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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.

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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.

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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

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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 surpris'd by the cold, under which it could not subsist; so that perhaps the whole species would be destroyed.

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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,

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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
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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-

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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 themselves 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 forcerers, 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.

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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.

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MEMOIR

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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

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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.

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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 cleanings 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
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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

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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
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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

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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 risk of being mistaken.

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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 risk 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

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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 plentiful; 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;

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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
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be buried, they sow the grass-feed, 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.

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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 only

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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 feeded, and in this manner it is kept 'till the month of December: by this management however, we run the risque of losing the feed. 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,

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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.

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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
astonishing

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,

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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 deposit 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 consequently, 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
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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 irresistible evidences of one or several capital revolutions which our globe must have undergone.

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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.

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The quarry of Grofornier 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 crystals, 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-

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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.

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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 immerfed, and the crust 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 lemuri- bus*, &c. page 1. chapter 16. and even the learned Agricola, in his dialogue *de re metallica*, &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. Lefser, 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. Lefser 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. Lefser, 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. Lefser seems willing to make us believe, the
figures

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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

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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,

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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

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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 crystals 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
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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

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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,

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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?

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I now come to the third class, which is limestone; 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 plaster, 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 plaster. Now, as these kinds of plaster 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,

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fish, the singular quarries of Querfurt, the mountains of plaster 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-

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water with the terrestrial particles, which it deposits 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

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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 Miffon, 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

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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,

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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

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vancing every way; and thus was formed the great lake at the foot of the mountain of limestone, 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 deposits 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

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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.

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When I was in Languedoc, I observed that in the cold mornings, the silk-worms were benumbed and moved but very little; 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
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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 preferred.

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 atone 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

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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 admittance 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

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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

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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

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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 pulleys 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

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will no longer eat; but seek to deposite their filk 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 filk-worms; for it afflicts them with looseness, makes them sick and languish to death, or at least destroys the beauty of the filk; 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

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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 filk-worms will be very attentive in choosing the cods, and dividing them into three or four classes, that they may have the finer filk, 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 filk 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 filk, 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.

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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

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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 filk, when they are good; so that the fifteen thousand will yield about six pounds of raw-filk. 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-

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tioned 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

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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-pan under it,

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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 stopp'd 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

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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 dyeing 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

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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,

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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

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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

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minutes 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.

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A TABLE,

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.	sol.	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 nume- rary, 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 contribu- tion, &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 ob- scurity 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 him- self 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

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livres

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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

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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.
<i>Paris</i> ; the French crown being valued at 3 livres.		
<i>Amsterdam</i> ; books are kept, and bills are drawn, in livres, sols, and deniers de gros; and in florins of 40 deniers de gros,	100	54
<i>Antwerp</i> ; books are kept, and bills are drawn, in livres, sols, and deniers de gros, and in florins of 40 deniers de gros,	96	51 $\frac{2}{3}$
<i>Cologne</i> ; books are kept, and bills are drawn, in rixdol- lars of 78 albus, the albus consisting of 12 deniers,	78	42 $1\frac{1}{2}$
<i>Copenhagen</i> ; books are kept, and bills are drawn, in rix- dollars of 4 orts, the ort consisting of 18 shillings,	4	2 $2\frac{2}{3}$
<i>Dantzick</i> ; books are kept, and bills are drawn, in rix- dollars of 90 gros, or in florins of 30 gros,	90	48 $\frac{3}{4}$
	K k 3	<i>Florence</i> ;

	The mark of silver at 27 livres.	The mark of silver at 50 livres.
<i>Florence</i> ; books are kept, and bills are drawn, in livres, fols, and deniers, and in ducats of 7 livres 10 fols,	6	3 4 9
<i>Francfort</i> ; books are kept, and bills are drawn, in florins of 60 kreuts, and in rixdollars of 90 kreuts,	90	48 $\frac{3}{5}$
<i>Genoa</i> ; books are kept in livres, fols, and deniers; and bills are drawn in piastres of 95 fols,	4 16	2 11 10
<i>Hamburg</i> ; books are kept in marks, fols, and denier lubs; and bills drawn in rixdollars of 48 fols lubs,	48	25 11 $\frac{1}{3}$
<i>Leipsic</i> ; books are kept, and bills are drawn, in rixdollars of 24 groschen, the groschen consisting of 12 deniers,	24	12 11 $\frac{2}{3}$
<i>Liege</i> ; books are kept, and bills are drawn, in livres, fols, and deniers, 20 fols = 1 liv. 12 den. = 1 fol.	4	2 3 2
<i>Lisbon</i> ; books are kept, and bills are drawn, in real, 400 of which make a crusado not marked,	600	324
<i>Leghorn</i> ; books are kept in livres, fols, 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.
<i>London</i> ; 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 $\frac{4}{5}$
<i>Madrid</i> ; books are kept, and bills are drawn, in maravedis, in ducats, in reas, in reals, and in pistoles,	160 $\frac{3}{11}$	296 $\frac{2}{11}$
<i>Messina</i> ; books are kept in ounces, taris, grains, and picolies; and bills drawn in ducats of 10 carlins,	9	4 $8\frac{1}{5}$
<i>Milan</i> ; books are kept in livres, fols, and deniers; and bills are drawn in crowns,	4 14	2 10 9
<i>Naples</i> ; 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 $\frac{1}{5}$
<i>Rome</i> ; 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
<i>Stockholm</i> ; books are kept in daalders, marks, and orts; and bills are drawn in copper rixdollars of 24 marks,	24	12 $\frac{2}{5}$

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Turin;

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	The mark of silver at 27 livres.	The mark of silver at 50 livres.
<i>Turin</i> ; books are kept, and bills are drawn in livres, fols, and deniers; 3 livres 15 fols making a crown, of 9 to the mark,	3 15	2 6
<i>Venice</i> ; books are kept, and bills are drawn, in ducats of 20 fols, the fol of 12 deniers,	24 7	12 11

E X P L A N A T I O N .

The French crown of $8\frac{1}{2}$ 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 fols, 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 fols, 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.

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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 Cologne 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 fols (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 fols in the mark, makes four per cent. at two ufances, eight per cent. at four ufances, 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 account, 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
Piafre of Genoa	3	5 11 1
Rixdollar of Hamburg	3	5 11 1
Rixdollar of Leipzig	3	5 11 1
The Liege crown	3	5 11 1
Crufada of Lisbon	2	3 14
Piafre 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

(508)

An Account of the BAPTISMS, MARRIAGES,
and DEATHS, in the City and Suburbs of
PARIS, in the year 1750.

Parishes.	Baptisms.		Mar- riag.	Deaths.	
	Boys.	Girls.		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. Germain 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 Evegne	166	172	91	93	105

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(509)

Parishes.	Baptisms.		Mar- riag.	Deaths.	
	Boys.	Girls.		Mal.	Fem.
St. Nicolas of Chardonnet	135	127	56	95	104
St. Benedict	139	126	79	88	92
Our Lady of Bon- nes Nouvels at Ville Neuve	137	144	74	69	67
St. James of Haut- pas	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,

(510)

BIRTHS, MARRIAGES, and DEATHS, at PARIS, in the year 1750.

Parishes.	Births.		Mar-riag.	Deaths.	
	Boys.	Girls.		Mal.	Fem.
St. Germans le Vieil	42	51	17	11	35
St. Peter des Areis	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. Dionyfius	13	22	7	10	16
Sainte Croix of the Citadel	19	13	4	7	6
The Holy Innocents	13	18	11	10	11
St. Joffe	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. Dionyfius, and John the Baptist,				1	3
Of our Lady,	4	6	4	1	6

St.

(511)

Parishes.	Births.		Mar-riag.	Deaths.	
	Boys.	Girls.		Mal.	Fem.
St. James de l'Hofpital	4	3	2	6	3
St. Lewis of the Invalids	5	3	2	5	12
Ste. Marine	1	4	4	6	
St. Lewis of the Louvre	4		1	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.		Mar-riag.	Deaths.	
	Boys.	Girls.		Mal.	Fem.
Hotel Dieu	665	666		2811	1648
Bicêtre	13	21		257	39
La Saltpetriere	7	5	4	126	389
Foundling Hospital, fuburbs St. Anthony				139	91
Les Quinze vingts	26	26	12	17	18
The Charity				320	
The Pity				13	3
St. Lewis					
Les Hospitalieres de la Raquette					16
The Incurables				18	22

5

Les

(512)

Hospitals.	Births.		Mar- riag.	Deaths.	
	Boys.	Girls.		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 inha- bitants of Paris, buried in the Timber yards,				24	14
Religionaires stran- gers				24	5
	<u>711</u>	<u>718</u>	<u>16</u>	<u>3841</u>	<u>2387</u>

B I R T H S.

	Boys.	Girls.	Marriages.
Total	9714	9226	4612

D E A T H S.

Males.	Females.
10045	8202

Excess of the Births 834.

Received into the Foundling Hospital 1943
Boys, and 1842 Girls.

BIRTHS,

(513)

BIRTHS, MARRIAGES, and DEATHS, in the City
of PARIS, and its Suburbs, in the year 1751.

Parishes.	Births.		Mar- riag.	Deaths.	
	Boys.	Girls.		Mal.	Fem.
St. Sulpice	1200	1135	636	617	674
St. Eustathius	1021	933	583	509	559
St. Margarine, 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 Grève	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
	<u>1200</u>	<u>1135</u>	<u>636</u>	<u>617</u>	<u>674</u>

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St.

(514)

Parishes.	Births.		Mar-riag.	Deaths.	
	Boys.	Girls.		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.

(515)

Parishes.	Births.		Mar-riag.	Deaths.	
	Boys.	Girls.		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 boeufs	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 Hospital	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

L 1 2

Hotel

(516)

Hospitals.	Births.		Mar- riag.	Deaths.	
	Boys.	Girls.		Mal.	Fem.
Hotel Dieu	704	661		2350	1680
Bicêtre	10	8		199	26
La Salpêtrière	2	4	4	103	425
Foundling Hospi- tal, 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 inha- bitants of Paris, buried in tim- ber-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.

F I N I S.