Leather Tanning

Tanneries are the centres for treating raw hides and skins and for supplying the raw material on which leather industries depend. The leather and tanning industry which were first introduced by Europeans may now be regarded as an Indian industry.

Although leather working is an age old industry of Bharat, the modern process of vegetables tanning and currying dates as far back as the Indian Mutiny, when the British military authorities manufactured leather for military equipment. The Government Harness and Saddlery Factory at Kampur has been tanning and currying harness leather and fabricating harness and saddlery and other military equipment for the army in India since 1867. The Cooper Allen & Company which was started in 1881, is now considered to be the largest tanning factory of Asia. (Ref. pp. 77-79) A few more tanneries were later on started chiefly by the hide merchants with the object of tanning those hides which were rejected by the Ordnance Factory.

1. Whyte, R.O. Farming for Industry, p.27. "Leather is a manufactured product made available to the world by all the skill of the tanner from hides and skins of animals, reptiles and even fishes and birds. The term hide is applied to the pelts of large animals such as cattle, horse and buffalo; skin to those of smaller animals such as calf, goat, sheep and pig; kid is used to denote a hide a little smaller than that of a full grown cow, but smaller than a calf skin."
The following figures would give an idea of the present magnitude of the industry in this State:

<table>
<thead>
<tr>
<th>Description</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of large scale leather working factories</td>
<td>11</td>
</tr>
<tr>
<td>No. of workers engaged in tanneries</td>
<td>3,750</td>
</tr>
<tr>
<td>No. of workers engaged in leather factories</td>
<td>20,000</td>
</tr>
<tr>
<td>Average number of hides tanned per day</td>
<td>5,000</td>
</tr>
<tr>
<td>Annual production of leather and leather goods</td>
<td>Rs.10,00,00,000</td>
</tr>
</tbody>
</table>

The tanning materials consist of barks, fruits or leaves of numerous trees and shrubs scattered about in the Indian forests. 'Babul' (Acacia arabica, Wild), avaram (Cassia fibrulata, Linn), myrobalans, bark of eucalyptus (mallet bark), 'ghont', kawa bark, 'dhan' leaves and 'amaltas' bark (Cassia fistula, Linn) are the materials generally used in Northern India for tanning leather. Of late, wattle bark (Acacia mollissima, Wild) imported from South Africa is being largely used in all the organised tanneries of Uttar Pradesh. The sudden stoppage of the foreign materials and shortage of 'desi' material had adversely affected the Kanpur tanneries in recent times. Some of them are of local importance and their supply is inadequate.

The quality of the raw material is known by the tanning contents found in the bark. In the matter of tanning content the 'babul' of Northern India stands at bottom and wattle extract appears to be the best. But the tanning contents differ from material to material and from place to place in the same material; e.g., 'amaltas' bark of Lalitpur range possesses 10.58 per cent tanning contents which is low, as the average is reported to be 12 per cent. But the resultant leather is of smooth grain and of fair colour. (See also Appendix XXV).
'Babul' bark is one of the most useful tanning materials available in the State. About 23 tanneries of Kanpur consume about 3,000 maunds of 'babul' bark every month (Ref. pp. 84-85). Since imports of wattle bark from South Africa had ceased recently, the demand for 'babul' bark had gone up tremendously. For this reason and with the depletion of 'babul' groves in the neighbourhood during the War and the years following, the price of 'babul' barks too has gone up tremendously. The industry is not in a position to increase the price of finished leather any further, as it has already reached the economic limit. The total yield of 'babul' from canal plantations in Southern Doab (Etawah Division) is only 3,000 maunds and in Northern Doab (Meerut Division) 1,000 maunds which is insufficient for the Kanpur Tanneries alone. (See Appendix XXVI)

Myrobalans like 'babul' are grown in plantations in U.P. and Madhya Pradesh. It is an important article of commerce and is used almost in every tannery of the world (except of course in chrome tanneries.) Large quantities of the latter are exported to foreign countries in various forms. Myrobalans are cheaper in Madhya Pradesh than it is in U.P. 'Ghont', 'kawa' bark and 'dhan' leaves are generally used locally for tanning purposes. The Bundelkhand Division alone yields 1,000 maunds of 'amaltas' bark annually.

The leather processed by wattle bark is firm and durable and hence wattle bark, because of this and other properties, has been the most extensively used tanning material in the leather industry of the State. For long the tanneries of Uttar Pradesh have been dependent on the imports of wattle bark from African countries. Australia is the home of wattle,
certain species of which have been introduced on the Nilgiri Hills, where they are flourishing fairly well.

Although wattle cannot be produced in the plains of Uttar Pradesh it can safely be planted in the higher altitudes, as is evident from the past experiments carried out in the Ranikhet area. It needs a frost-free season and stable rainfall. It is said that a suitable area of about 10,000 acres of land is available for the cultivation of wattle in this State and this would bring forth an estimated annual production of 5,000 tons of wattle bark which is only a scanty proportion of its total demand. Recent experiments initiated in the West Almora, East Almora, Naini Tal and Chakrata forest divisions are not very encouraging. It is necessary to continue experiments on a nursery basis in these areas prior to any large scale expansion.

The bark of avaram is largely found in Southern India. It is a species easy to grow. Its thrifty nature and adaptability to poor soils make it an ideal species for the Yamuna ravines, where little else can grow. But its successful raising in these ravines and along canal banks could not compete with 'babul' (Acacia arabica) for its greater cost of debarking and also for its inferior fuel despite its higher tanning contents. Bark can be peeled off easily during the monsoon - July to September. Tanning contents are at their highest when the bark is easiest to peel in July and August. They decrease with advance of cold weather.

The bark of Eucalyptus occidentales (mallet bark) a native of Australia is very rich in tanning and harder than wattle. It can be grown in the Ganga basin. Therefore, the Forest Department should arrange to procure seeds and literature on
this species. The barks of the Himalayan oak and chestnut are comparatively rich in tanning. The difficulties of economic working of hill forests appear almost insuperable. Besides, the bark of 'sal', 'arjun' and 'Harra', the fruits of 'bahera' and 'amla' and the leaves of 'dhaora' are also used for tanning purposes to a limited extent.

Most of the chemical compounds used in tanning are imported from foreign countries, while some of them are of Indian origin. Kanpur situated in the interior of the country is at a disadvantageous position in regard to the chemical industries and imports of chemical compounds.

Hides and skins are obtained from domestic animals, namely buffalo, cow, sheep and goat. These are collected all over the country but their supply is not uniform, as it depends upon the total cattle population in different regions, and a number of other factors, such as the religious sentiments of the people. These are stored up at important centres, namely Calcutta, Patna, Kanpur, Lucknow, Delhi, Amritsar, Bombay and Madras which are also important hides and skin markets.

Taking the buffs and kips together, U.P. occupies the third place in India, but the superior and the best class of kips for making high class chrome upper leather are specially obtained only from the western districts of Uttar Pradesh, namely Aligarh, Agra, Meerut, Bareilly, Moradabad, Rampur, Lucknow and Mathura, as in these parts good grazing grounds are extensively available. Hides of these districts known as 'purchain' are in great demand from chrome tanners in all parts of India.

The most common types of leather produced are:

1. Chrome tanned, viz., glazed kid, upper calf, etc.
2. Vegetable tanned, viz., sole bends, belting, harness.
3. Patent and imitation leather are produced in small quantities.

As regards goat skins, Uttar Pradesh is pre-eminently the largest producer and is responsible for the production of nearly a fifth of the total in India, while in cattle hides and sheep skins it holds the 4th position. Regarding the characteristics of the skins, the goat as well as sheep skins of U.P. are of medium quality as compared to Bihar, Bengal and Madras. The bulk of the pit tanned harness leather made from better grades of buffalo and heavy cow hides is produced at Kanpur.

The supply of labour, both skilled and unskilled for this industry has been drawn from the 'Chamars' and 'Mochies' the only communities, who will agree to perform certain process in leather. The largest concentration of 'chamars' and 'mochies' population in India is in Uttar Pradesh and this has an important bearing on the extent to which tanning and shoe and leather goods industries can be carried out in the State. According to the census of 1931, 63,22,000 chamars and mochies are distributed in this State forming 38 per cent of the whole community. With the exception of the Bata Shoe Company, Ltd. Batanagar (Bengal),

<table>
<thead>
<tr>
<th>Particulars</th>
<th>1937-38</th>
<th>1954-55</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hides imported into U.P.</td>
<td>1,45,198 mds.</td>
<td>5,03,655 mds.</td>
</tr>
<tr>
<td>2. Hides exported from U.P.</td>
<td>2,10,015 &quot;</td>
<td>30,096 &quot;</td>
</tr>
<tr>
<td>3. Skins imported into U.P.</td>
<td>20,188 &quot;</td>
<td>32,679 &quot;</td>
</tr>
<tr>
<td>4. Skins exported from U.P.</td>
<td>1,12,633 &quot;</td>
<td>1,07,673 &quot;</td>
</tr>
</tbody>
</table>
number of present factories should be multiplied at least ten
ten of machines working at present should be doubled and the
them shoes they need, at the price which they can afford. The
or bare feet that cover daily some 15 miles. In order to give
India needs any kind of footwear to protect themselves
In a year. Moreover, therefore, enormous potential demand for
people requiring three pairs
only about 6 per cent. Every town in India have a
In the industry produce
other鞋 are known and
other shoes are made by machines.
where (near) the hand and shoe-making factory, which
bevel
harass and saddles are mostly made lined at Kanpur. Bhat
Many boot's
area is the other shoe production centre of Upper Pradesh
bevel the state
shoes spread
production is concentrated
the leather goods industry
for leather goods, Uttar Pradesh has been developed the
extent together with the extensive railway and cultivation demand
in the resources in landing materials and hides, and
shoes made
Almost all the tanneries are located on the bank of the Ganges
All the tanneries of India are located only in Uttar Pradesh.
Suggestions

The Government Harness and Saddlery Factory, Kanpur, established to meet the requirements of military leather equipment, produce its own leather, the quality and workmanship of which is 50 per cent above that of the products of the trade. Under such circumstances, if the Government factory is stopped, as recommended by the panel, the trade units would not get impetus to develop the industry to the specific standard. India is the second largest raw hides and skins producing country in the world, while England alone has more than 20 times the number of tanneries India has. Even the existing industry in this State has not yet developed in its true sense as it has done in the Western countries. Therefore, both the number and standard of the tanneries have vast scope to develop in U.P.

The demand for 'babul' bark by the U.P. tanneries is likely to last for a long time. It is therefore necessary to make a long term plan and to conduct a detailed field and laboratory investigation on this subject to meet the increasing demand of the tanning materials. In order to ensure a sustained supply at an economic price, Government should emphatically declare that 'babul' bark from State lands be earmarked for supply to Kanpur and other tanneries of the State. Besides, it should be the policy of the State to raise 'babul' plantations in all suitable State lands. It should be raised as a regular measure on a short rotation of 10 to 12 years for both fuel and bark. 'Babul' plantations have been tried and experimented upon the outer hills. It may be worthwhile to try them along the railway lines and the canal banks between Hardwar and Roorkee and along
the lower Ganga Canal near Kanpur, i.e. in cool places where plenty of under-ground moisture is available.

By far, the best area for raising 'babul' is on the Unnao side of the Ganga bridge near Kanpur. The area is silted every year. There is plentiful 'babul' regeneration. The area is interspersed with cultivation dotted here and there. A very great drawback of this material is said to be the fact that the whole tree is to be felled to get the bark and hence such a material cannot become the basis of expanding industry. But at the same time one should not forget that 'babul' is a great agent of fertilising the 'usar' lands which cover a vast area of this State. Once the trees are planted in 'usar' lands, they would not only reclaim the land but at the same time, provide the material for the tanneries, timber for construction and fuel to the farmer.

The transport difficulties have also affected the supply of the tanning material. The 'babul' bark made available at the rail head at Rudarpur (Bareilly) is going a-begging for lack of transport. There is not even a local demand for it.

It will be better, if instead of transporting the bark from plantation to the tanneries, arrangements are made to separate the tanning extract near the plantations and transport it to the tanneries. In case the area under 'babul' plantation is increased, a 'babul' bark extraction factory should be established in U.P. The spent bark after extraction is good material for pulp- ing. Its strong fibres make excellent wrapping paper. The wastage of 'babul' barks by burning the fuel without stripping the bark should be prevented.

The question of utilizing wood excluding the bark is of great significance. Natal (South Africa) is fortunate in finding a ready local market for the wood after debarking, which is largely employed for mine props and as fuel. Estimates of the returns from plantations in Natal show that of the total receipts 56 per cent was derived from the sale of bark, 33 per cent mine props and 11 per cent from fuel.

The U.S.A. Government has not only made a scheme for growing wattle but is also utilizing the timber for the manufacture of paper. India may go a step further in this respect by utilising the spent bark for the manufacture of news-print, if research brings out promising results and the wood for the manufacture of acid, acetone, charcoal and other products by destructive distillation. Accounts are available of such possibilities.

The cultivation of tannirg material may be expected to compete with other agricultural industries, when some mechanical means have been devised for stripping the bark, specially of averam or more profitable use is made of the by-products of the industry.

With a view to finding an effective substitute, other materials should be investigated. If possible, as in Germany, synthetic tanning materials can also be manufactured in the State.

It has to be admitted that the ban on cow-slaughter would affect the hides and skins trade of India, as it forms an important part of the total production. A major portion of the cattle hides is derived from the naturally dead stock and the

balance, a minor portion, from slaughtered animals. The latter is more valuable, while the former is deficient in making good leather.

For improving the standards of the quality of skins and skins from the tanneries, much, however, can be done by the farmers and slaughterers. This is particularly true of the goat, a large number of which thrive in semi-confined condition. Then it might be fewer goats but much better ones. It seems well established that the goat is conducive to the production of cattle reared almost invariably on the bush vegetation, which is often harmful to skin. So these animals exist in a semi-confined condition. Then it might be fewer goats but much better ones. It seems well established that the goat is conducive to the production of considerably finer and thinner skins.

The improvement of breeds of animals scientific and nutritious is always a matter of science and disease and the imposing of public health measures.
balance, a minor portion, from slaughtered animals. The latter is more valuable, while the former is defective for making good leather.

For improving the standards of the quality of the hides and skins from the tanneries, much, however, can be done by the farmers and slaughterers. This is particularly true of the goat, a large number of which thrive in areas, where they exist on a bush vegetation, which is often thorny and, therefore, harmful to skin. So these animals must be maintained in a semi-confined condition. Then it is probable that there would be fewer goats but much better quality skins. Besides, it seems well established that good feeding at least to an optimum is conducive to the production of high quality skin. Dairy cattle reared almost invariably on improved pastures produce considerably finer and thinner hides. But the animal husbandman primarily producing meat, dairy produce or wool, rarely, if ever, is conscious that he is also the supplier of raw material to another and equally vital industry.

The improvement of breeds of livestocks, feeding the animals scientific and nutritive fodder, extermination of diseases and the imposing of ban on striking animals with sharply pointed goading sticks, not to let the cattle live till old age, and the training of indigenous 'chamars' in the art of flaying and currying are some of the steps to be taken in this direction.

1. Panel Report page 6. "Like buffalo hides, about 25 per cent of the cow hides are derived from slaughtered animals and the balance from the fallen stock."
As U.P. is the greatest supplier of goat skins, denatured salt should be made available widely in rural areas to facilitate wet salting even by the village 'charmers' and small butchers. Provision of wooden wagons to prevent damage of wet salted hides and skins, restoration of inter-state traffic in raw hides and the classification of these under perishable goods for railway transport are some of the other steps for the development of the industry.

Fibre suit cases, canvas shoes, and rubber products should to a great extent, supplant leather goods. The development of synthetic products are necessary to solve the problem of shoes, for the price which the Indians can pay and the problem of cow slaughtering.

The indigenous type of foot-wear is all hand-made, mostly on cottage lines. It thus differs radically from the modern shoe industries of Europe and America, where mass production by machinery, in big factories, is in vogue. But the foot-wear industry should not be encouraged on the scale of Allen & Co. and Bata Shoe Company. But in order to provide employment and to produce cheap shoes for the poor, small factories should be provided small hand-driven machinery for the purpose of the manufacturing hand-made shoes. Many of such factories interested in mechanising are to be found at Agra.

There is also enormous scope for the growth of the leather goods industry making such articles as ladies hand-bags, purse, cigarette cases, spectacle cases, leather bags, tobacco pouches, wrist-watch bands, etc. Besides, foot-wear can be exported to the Western and South Eastern countries of Asia.
Further development of the tanning industry can be expected if the export of the raw hides and skins is entirely stopped and replaced by the export of tanned leather and leather goods.

Pigs are specially bred for their skins in Germany and Austria, whence come very fine quality pelts. It should be experimented in this State also. Belting leather with properties of considerable strength is not produced in India. Experiments should be carried on to produce this kind of leather from selected hides by pit method of vegetable tanning as is done in Europe and America.

The German chemical industry is reported to have produced a number of materials, which are all useful for leather and leather goods industry. Hence, Indian students should be sent to Germany to acquire a knowledge of the techniques of production of German leather and also to learn the production of canvas and rubber shoes.

WOOLEN TEXTILES.

The woollen mill industry is not as old as the hand-spinning and the handloom weaving of wool in India. However, the foundation of the first modern woollen mill of India was laid in Uttar Pradesh in 1876. Although the circumstances on the whole are more favourable for the development of this industry in the Panjab and Kashmir than in U.P., yet its location at Kanpur, from the economic point of view, is quite scientific. It has made great progress since its inception and seems to have a bright future as well.

1. Sharma, T.R. The location of Industries in India, page 70.
1950

UTILIZATION OF WOOL

SCALE 1 INCH = 5,000 lbs

AVERAGE ANNUAL MILK YIELD PER ANIMAL

SCALE 1 INCH = 1,000 lbs

REFERENCE

BLANKETS
MODERN MILLS
CARPETS
YARN FOR SALE
OTHER USES

REFERENCE

COWS
BUFFALO
GOAT
Out of 15 factories of India, 5 are located in U.P. alone.

These are:

(i) The Canpore Woollen Mills, Kanpur, popularly known by its trade mark as 'Lal Mill',

(ii) J.K. Woollen Mills, Kanpur,

(iii) Allahabad Woollen Mills, Allahabad,

(iv) Shri Laxmi Woollen, Carding, Spinning, Weaving Works, Gorakhpur, and

(v) E. Sefton & Co., Ltd. Mirzapur.

These are the self-contained mills, which carry out the complete process of manufacturing from the raw wool to the finished product. The total number of persons employed in all the five mills is 4,843 on a daily average.

Out of the total number of 2,300 power looms in India 355 are in U.P. while the number of handlooms accounts for 3/5ths of all India. Besides, there are 9 carpet looms. The total number of spindles in the State is 21,876.

There is not much wool in the State itself. Thus the industry depends mainly on imported wool as most Indian wool is unsuitable for worsted process. Coarse wool used for blankets and tweeds is imported from Rajasthan and the Panjab. Pure wool of long staple is imported from Tibet. Apart from these, considerable quantities of wool are imported from countries given below:

<table>
<thead>
<tr>
<th>From whence</th>
<th>1945-46</th>
<th>1946-47</th>
<th>1947-48</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.K.</td>
<td>10,114</td>
<td>44</td>
<td>5,309</td>
</tr>
<tr>
<td>Australia</td>
<td>10,954,700</td>
<td>22465</td>
<td>13,003</td>
</tr>
<tr>
<td>New Zealand</td>
<td>7,716,659</td>
<td>8262</td>
<td>1,975</td>
</tr>
<tr>
<td>Other countries</td>
<td>346,958</td>
<td>131</td>
<td>122</td>
</tr>
<tr>
<td>Total</td>
<td>19,028,431</td>
<td>11039366</td>
<td>20,390</td>
</tr>
</tbody>
</table>

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<tr>
<td>Total</td>
<td>19,028,431</td>
<td>11039366</td>
<td>20,390</td>
</tr>
</tbody>
</table>
With the increasing production capacity of the mills every year, the imports of the raw materials would also go up. The annual production from June, 1953 to June, 1954, was as follows:

<table>
<thead>
<tr>
<th>Name of the Mill</th>
<th>Quantity in lbs.</th>
<th>Value in Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cawnpore Woollen Mills</td>
<td>32,45,500</td>
<td>1,91,59,618</td>
</tr>
<tr>
<td>Shree Laxmi Mills</td>
<td>60,000</td>
<td>10,500</td>
</tr>
<tr>
<td>E. Sefton &amp; Co.</td>
<td>82,122</td>
<td>1,69,376</td>
</tr>
<tr>
<td>J.K. Woollen Mills</td>
<td>3,16,615</td>
<td>11,55,255</td>
</tr>
<tr>
<td>Allahabad Woollen Mills</td>
<td>1,99,957</td>
<td>5,49,882</td>
</tr>
<tr>
<td>Blankets</td>
<td>6,720</td>
<td>1,00,444</td>
</tr>
<tr>
<td>Duries</td>
<td>3,797 sq. yds.</td>
<td>35,161</td>
</tr>
</tbody>
</table>

The peak year of Indian production was 1944, when the output amounted to 48,500 lakh yards, a figure which was regarded as unlikely to be repeated again because of the shorter working days in the future (Ref. page 86). The total production of 1947-48 was 13,672,600 lbs. valued at Rs. 20,630,354. Of late there has been a tendency to produce materials of better quality, though the production of coarse goods still continues. Workmanship has improved considerably and quite a large number of designs are now available.

The 'Lal Mill', or the Cawnpore Woollen Mills Co. Ltd., is of outstanding importance in the whole country. It employs 3/4ths of the total labour engaged in this industry. Presently, it has been manufacturing flannels, serges, broad cloth and blankets. The raw material is imported from all parts of the country and also from Australia.

The lines of development for these mills were laid down at a very early date and continued expansion went on along those lines throughout, most remarkably during the war periods. The serious fire that broke out in 1919 did not greatly affect the working of the mills.
Before the war, the industry did not flourish very much, due to competition of cheap woollen goods imported from abroad. However, during the World War II the industry received considerable impetus as it was fully occupied in producing woollen materials to meet Army requirements. Although presently the prices compare with those of the imported goods still it is beyond the purchasing power of the rural masses. Hence mixed woollen articles with good finish and appearance, as is done in Europe and America, are the need of the day.

Regarding the quality of the goods, it should be highly improved on the handloom to compete with the more highly specialised varieties of foreign countries. This can be achieved by using improved quality of wool. Like the foreign industries and more specially like those of England all the sections of the wool industry, e.g. spinning, weaving, etc., must be in separate units instead of making them self-contained. This would result in the very high standard of perfection of the finished goods.

Although the demand for woollen goods is seasonal, yet it is much above the normal production. Hence the mills should be run perennially. Newer varieties of fabrics should be introduced to give a dead stop to the foreign imports of such articles.

Woollen Carpets - It is difficult to say exactly when the industry of carpet weaving was established in Mirzapur. Carpets were made in Jaunpur and Allahabad during Akbar's reign and it is possible that the weavers from these places migrated to Mirzapur. There is no doubt, however, that the industry has been in existence for more than 150 years. There is a general tradition that the manufacture of carpets first started in the village of Ghosia.
and then spread to the adjacent village of Macho Singh and these places are still the chief centres of the industry in the rural tracts and are passed by pilgrims on their way to Banaras, Allahabad, or Vindhya Chal. It is possible, therefore, that the manufacture was in early days stimulated by the demand for cheap carpets and prayer mats on the part of these pilgrims. The district had further advantage of providing wool. Its rural character is further obvious from the fact that over 3,000 weavers are settled in villages while only about 400 work in Mirzapur.

The best designs formerly in use were copies of old oriental carpets which had been sketched and painted for Messrs. E. Hill & Company by their London Agents from original in different museums, but nearly 98 per cent of the total production used to be exported to England and therefore the designs most favoured were such as were required in European houses. The industry made rapid strides with the development of export trade and the weavers had to face some difficulty in obtaining the requisite labour to work their looms because those who formerly worked at these looms became loom-owners.

The industry suffered too much during the War as the exports were closed. In the Mirzapur District the weavers found an alternative occupation in the production of barrack blankets for soldiers. After the War, they resumed their work of making carpets. It is said that at present 20 lakh square yards of carpet valued at over one crore rupees is produced, but the existing cut-throat competition is feared to result in the deterioration of the quality. This would have an adverse effect on their exports. Inexperienced capitalists are rushing to this
industry which may prove detrimental to this industry.

With a view to reducing the cost of production of woollen carpets and thus popularising them in foreign markets the manufacture of machine-made carpets may be strongly recommended. The machinery required to this end could be imported from Germany and U.S.A. The superior carpets made at Agra and, to a smaller extent, at Mirzapur, are woven from Australian mill-spun yarn.

**CHEMICAL INDUSTRIES.**

Chemical industries on a small scale have not been successful as the prices of raw materials have always been prohibitive in the State. Clays are available here at prices higher than the prices at which naphthalene and anthracene are available in other countries, and distilled water and kerosene oil at prices higher than the prices at which benzene and carbolic acid are sold in England. The parts of machinery supplied by engineering firms in India for chemical industry too did not prove a success. This makes a large number of chemical industries in the State a dream.

However, excepting sulphuric acid, the production of acids at present is sufficient to meet the demand of the State. To increase the production of sulphuric acid M/s Mathur and Manzoor of Kanpur are planning to install a 10-ton plant; and when erected, would meet the demand of the State.

With the development of new industries, like rayon, fertilisers, chemicals, etc., it is expected that during the
coming years its consumption would increase in the country
(Ref. page 81). About 5,270 tons of sulphuric acid is
presently produced in U.P. as given below:

1. Kanpur Chemical Works, Kanpur 44.36 tons
2. Mining and chemical Industries, Agra 425 "
4. Vidhay Prasad Chemical Works, Ghaziabad 254 "
5. U.P. Chemical Works, Lucknow 76 "
6. Banaras Chemical Factory, Banaras 40 "

With the development of paper industry in the State the
demand of sulphates would further increase. Sulphuric acid
and bauxite are the raw materials required for its production.
Sodium sulphate is largely used in the tanning, paper and
textile industries. Magnesium sulphate is used in medicine
and finishing of cotton fabrics and the State is self-sufficient
in this and hydrochloric acid. Hypo and sodium bi-sulphite,
potassium chloride and sodium chloride, nitrogen are also pro-
duced to some extent. Potassium nitrate is mostly used as a
fertiliser and for the manufacture of gun powder, sulphuric
acid, nitric acid and potassium salts. It is largely available
in the district of Farrukhabad and Mathura which produce
about 8,000 tons of potassium nitrate per year. There are
about 60 refineries of saltpetre in U.P. The surplus product
is exported to other States as well.

Lime-stone to the extent of 34 million tons, as a source
of chemical lime and for the manufacture of calcium chloride,
is found in the State. It is largely used by sugar industry
and for building purposes.

Many industries of the country suffered badly for acute
shortage of soda ash and caustic soda during the last War. In
order to do away with this shortage, the State Government has
started the manufacture of these chemicals at Kanpur, Azamgarh and Mohanlal Ganj. A preliminary survey of the naturally occurring 'reh' in various districts of U.P. indicated a bright prospect of this industry (See Appendix XXVII and XXVIII).

M/s Mathur and Manzoor Co. Ltd., and Ganesh Flour Mills, have been recommended 10 tons and 5 tons electrolytic plants respectively from United Kingdom. After the arrival of these plants the position of the production of caustic soda would be more secure in the State. The Government is also planning to install a big mercury cell electrolytic caustic soda plant of about 20 tons per day. Potassium chlorate, which is used in the match industry, is being manufactured by the Western India Match Co. Ltd. Bareilly (Ref. pp. 188-89, Chapter VII).

Super phosphate is manufactured from bones which are largely available in U.P. and is used for manurial purposes for hilly tracts and usur lands. Gelatine and glue-making are side industries.

Dichromates are extremely useful in chrome tanning of leather, Khaki dyeing and the production of various pigments. The Kanpur Chemicals are producing about 1,200 tons dichromates per year sufficient to meet the State demand. It is being exported to foreign countries and the industry is flourishing very well.

There are five starch-producing factories in U.P., but due to the shortage of maize and other cereals, which are required for food supply, the factories are not working to their full capacity. Some of them are also making glucose in liquid form.

Besides the afore-mentioned heavy chemicals, the State manufactures various fine chemicals and pharmaceutical products as well e.g., acetone and glycerine.
Alcohol is required for the manufacture of chloroform, acetic acid, perfumery and pharmaceutical preparations, and a number of other products. It is also being used as a fuel by automobiles wherein it is required in large quantities. It has been well established that its mixture ranging from 15 to 25 per cent gives a fuel definitely superior to neat petrol for motive purposes. U.P. is the largest producer of alcohol in India, and will continue to have the lead even in the scheme of expansions. The development of this industry would relieve our worry of the scarcity of petrol to a great extent.

The raw material used is practically all molasses except in cases where 'mahua' is used for the manufacture of country liquor. The State produces about 80,00,000 maunds of molasses yearly, perpetually gluttoning the tanks in the sugar factories. This is sufficient to manufacture more than a crore gallons of power alcohol in the State, whose consumption of petrol can well be anticipated in the neighbourhood of 15 lakh gallons per quarter. Considerable quantities of molasses are either wasted or exported annually and in this respect it may safely be termed as a neglected industry of the State.

The great shortage of petrol due to the impact of the World War brought about in its wake certain developments in this industry by private enterprises. All the 21 distilleries in the State, because of the introduction of prohibition, are utilising the alcohol for industrial purposes. The Central Distillery and Chemical Works,

LTD. Meerut, is the pioneer factory in the State for the manufacture of power alcohol. Its capacity is 2,000 gallons a day. A few more sugar factories are also fixing new plants for the manufacture of power alcohol. But in no year the production from those distilleries has gone beyond 25,000,000 gallons i.e. only 1/4th of their capacity. However, it is 90 per cent production of the whole country (Map No. 32). There is still a great scope left for the development of power alcohol industry in U.P. (See Appendix XVII A).

GLASS INDUSTRY

The discovery of glass is popularly ascribed to some shipwrecked Phoenician merchants in the olden days while at work over the sandy banks. But the art of glass-making was known to Indians long before the Christian era, as it has been referred to in connection with female ornaments in Yajurveda\(^1\)\(^2\).

Though glass manufacture in India on modern lines dates only from the 90's of the last century; yet it was established on a solid and permanent basis only with the outbreak of the Great War I, when some pioneer efforts were made in this direction in Uttar Pradesh, which now holds by far the most important position in India and where it is still thriving. The establishment of new glass factories in this State stepped up production to such an extent as to meet half the total requirements of the country, where before 1939 only a quarter had been

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2. Dobbs, Monograph on pottery and glass industry of N.W. Province and Oudh, 1895, Chapter IX, page 29.
met. The State has 12 hollow wares factories, one sheet glass factory, two electric lamp factories, 47 bangle factories and more than 1,000 cottage workshops. The total value of the output of the industry is estimated to Rs.2 crores. A new product called windolite has been manufactured and the production of glass tubes, surgical and laboratory requirements has shown marked increase.

Glass manufacture is an industry whose location has been mainly influenced by natural factors. The industry consumes large quantities of sand and coal. Hence, most of the factories are situated in the heart of Usar tracts where 'reh' is found in plenty or near the coal mines where fuel is cheaply available. The Firozabad Centre has the benefit of the availability of skilled labour. Some 50 years ago, the crude glass industry was scattered in the Doab between Meerut and Etawah, but now the labour has migrated to the Aligarh and Firozabad Centres.

The best deposits of sand are found in U.P. from Lohgarh to Baragarh in Allahabad and Banda Districts, popularly known as the Naini Area (Appendix XX B). The sand in these districts and Bundi District of Rajasthan occurs in Vindhyan quartzites. The reserves of sands in the Naini area are undoubtedly very extensive estimated at about 11,00,00,000 tons. The reserves near Bundi have been estimated at 11,62,000 tons. Both the deposits are within easy reach of the lines of communication.

The other gradients used in the manufacture of glass are mainly silica, soda, potassium carbonate, lead, chalk, marble,

1. Lokanathan, P.S. Industrialisation, 1946, pp.11-12.
2. Fox, C.S. Notes on Glass Manufacture, 1922.
lime-stone, metallic oxides and declourisers. The industry is largely dependent on foreign imports of all these chemicals except soda and lime. The U.P. Glass Works manufactures its own salt cake and hydrochloric acid and provides some other centres with the surplus of these raw materials. Lime of good quality is available from Dehra Dun or Mirzapur, but the bulk comes from Katni in Madhya Pradesh.

Fuel for the large factories is brought from the Bengal and Bihar fields. As for the packing material, it generally consists of 'sarkandas', 'ban', baskets or the leaves of rice and sugarcane, the former two grow abundantly in the Khadar of the Ganga.

Development of Glass Furnaces - Nearly all the glass factories in India started their work with pot-furnaces, which were imported from Japan and were later on replaced by tank furnaces. The construction of the latter requires the dexterity of the great technicians and for the same reason, these are found only in big factories. The tanks may have direct firing furnaces or may be designed for the use of gas produced by destructive distillation of coal. The former costs much less to construct, but consumes twice the amount of coal required in the latter. The trend towards changing over to tank furnaces received further impetus immediately after the outbreak of the War with Japan, when it became difficult to get pots from that country.

The Glass Technological Section at Banaras is mainly concerned with the development of the large-scale glass industry. In the past few years it designed, constructed, staffed and put into operation several modern factories within and outside the State, from which approximately 4,000 families now derive their livelihood.
Besides, improvements were made in annealing system and kilns of modern types were introduced. The establishment of two up-to-date factories, one in the east and another in the west of the State (at Benaras and Ghaziabad respectively), fully equipped with semi-automatic bottle-making machines, is the outcome of these improvements. Today some 80 machines of this type are in use in the State.

1. Total number of glass factories 174
2. Factories having regenerative or re-cuperative furnaces. 24 (13.8%)
3. Factories, out of the above 24, which have efficient and well designed furnaces. 10 (5.7%)

Considering the total amount of glass produced in the bangle industry, the improvement in the construction of furnaces for producing even the bulk glass has not, however, been noticeable. The size of the average factory is not very large and the number of factories with capital exceeding a few lakhs, is comparatively very small. The production of 100 million tons of glass, equal to one-third of the world production, from 3,000 factories in U.S.A., in 1937 is amazing to Indian minds. The glass industry thus represents diverse type of industrial organization, varying from cottage industry to large scale units controlled both by proprietary and managing agency systems.

With the development of chemical industry, perfumery, and intoxicants and for the purpose of increasing scientific researches, the production of glass containers should rise. But unfortunately the manufacture of bottle-ware is generally done on

cottage lines, and though these are manufactured in quite a large number, they are generally of poor quality.

The U.P. Glass Works, Ltd. Bahjoi, established in 1921, is a pioneer enterprise of its kind in the State. The machinery and implements were purchased from America, and for expert advice and practical guidance, the Company employed American engineers and Belgian experts. Having a fairly long struggle against tremendous odds for market, the glass works produced some 60,00,000 square feet of glass sheet in the pre-war period, while during the war the commodity was sold like hot cake all over Northern India and fully and satisfactorily met Government demand.

Glass bead-making, developed by the Government in Uttar Pradesh in 1940, is now a well-established cottage industry. The two training centres are at Khurja and Banaras. At present there are about 90 cottage workshops, scattered all over the State. They manufacture beads worth Rs. 2.5 lakhs annually.

As the bead industry requires coloured glass rods of a rather special nature as raw material, this is normally not available. The Glass Technology Section, U.P. constantly evolves new types of glasses, which are handed over to large-scale factories for manufacture of rods strictly according to the formulae supplied to them. At present 4 factories manufacture and keep stocks of rods from which the industry draw its raw material. Before the outbreak of the last war, India was importing glass beads and false pearls valued at Rs. 15,00,000 per annum.

The two big factories of Shikohabad manufacture about 60,000 lamps per day. A new factory has been erected at Dehra Dun to meet the requirements of large production of optical
...and scientific instruments. The glass shells for electric lamps are manufactured by Kaycee Glass Works, Ltd., and the Ganga Glass Works, Ltd.

The main centres of the industry producing utility goods are Aligarh, Allahabad, Etah, Shikohabad, Makhanpur, Harangau, Sasni, Hathras, Bahjoi and Balawali. Firozabad has the monopoly of bangle manufacturing in India, and local initiative succeeded in gradually reducing the imports of bangles to a negligible figure. The total production capacity of the glass industry in the State is approximately as follows:-

1. Hollow wares, pressed ware, etc. 21,000 tons
2. Sheet Glass 5,500 "
3. Bangles (Value) Rs.3.6 crores
4. Bottles (Value) Rs.1.0 crore

This production meets only 30 to 40 per cent of the requirements of glasswares other than bangles consumed in the country¹. In spite of the scarcity of chemicals and coal the bangle industry has undergone great expansion during the War, mainly on account of the stoppage of import from Japan and Zechoslovákia, the two principal exporters of glass bangles to India.

MAP OF MIRZAPUR
WITH RELATION TO THE
VARIOUS CEMENT INDUSTRIES
IN BIHAR WHICH USE
ROHTAS LIMESTONE

INDEX

- Rohtas Limestone
- Kajrahat Limestone

- Cement Factories
- Existing Railways
- Proposed Railways
- Aerial Ropeways

Scale 1" = 16 MILES
The State was not represented till recently in the manufacture of cement which is playing the most important role in the development of large scale industries these days. But the location of the most important section of the cement industry of India in a belt running from Bihar to Gwalior and the investigation of the existing minerals in the Mirzapur District has made it possible for the establishment of a cement industry in this State (Map No.33). Under the Industrial development scheme of the State, the Government has installed a cement plant at Churk in the District Mirzapur with the object to supply cement for the construction of the Rihand Dam.

The principal raw materials for the manufacture of cement are lime-stone, coal and clay. The other ingredients are mainly magnesium carbonate and alcalies. The manufacture of 250 tons of cement per day requires 93,750 tons of limestone per year. From the description of the lime-stone deposits (pp. 56, 58-59) it will be seen that the deposits of lime-stone suitable for the manufacture of Portland cement are practically inexhaustible within the State (Map No.34). The Kajrahat lime-stones, though not yet sampled to their entirety, have been estimated to have extensive deposits suitable for the manufacture of cement. The Bichchi band is a coarse-grained dolomite lime-stone. The rock is well suited for ornamental building stone and estimates a reserve of about four million tons. "It is likely that the reserves are more, since the deposit is larger than that mapped by Dr. Mehta".

1. Sharma, T.R. Location of Industries in India, p.257. "Factories representing 45 per cent of the productive capacity of the entire country are situated in this belt".

Since the deposit is likely to be submerged when the Rihand dam is completed, it is desirable to give priority to this deposit and see how best it can be utilised. Its use as a building stone and also for lime-making in connection with the Rihand dam project must be considered. Although, the deposit is not very far from Pipri as the crow flies, the present road via Mirpur is rather circuitous (about 18 miles). The quartzites can be used for the proposed Dudhi Chopan Road.

The Garia deposit is similar to the Bichchi band, but it is not so extensive. It is estimated to yield 10,00,000 tons of material for the purpose of lime-making. It will not be submerged. Ningha lime-stone may also be found useful.

The Belwadah calcite deposits have been estimated to contain over 3,60,000 tons of material. But the transport to the nearest railway station at the moment makes it uneconomical to work the deposits. Therefore, it should be reserved to be used in the manufacture of cement for the dam at Pipri.

The analysis of the tufas of Naini Tal and Dehra Dun prove that they are quite suitable for cement manufacture. The inferior lime-stone of Krol area near Naini Tal is worked at places for lime burning. Clays are found at various places in the southern part of Mirzapur District. Barakar clays are found at Makhrikhob and Bansi, China clay occurs at Koldomri, Bairpau and Kathowli and Kaoline occurs at Mohali extending in an area of 600' x 400' and 10 to 12 feet deep (p.55). Approximately 0.5 ton of coal is required for the production of one ton of cement and brought from Bihar or Singrauli coalfields in Mirzapur District (pp. 53-54).
A fair weather road crosses the river Son at Chopan which is situated 62 miles from Mirzapur on the southern bank of the Son. There is no bridge on the Son river and it is crossed only by ferries. The Pohtas lime-stone occurs on the northern side and the Kajrahat lime-stone occurs on the southern side near Chopan. The dam site is also approachable by road from Garhwa Road Railway Station. Besides, a branch line can be constructed from the Dam to Chopan, a distance of about 26 miles to tap the lime-stone deposits.

The Government of India has decided to double cement/and for Uttar Pradesh allocated 2,00,000 tons of cement production. In the initial installation it is manufacturing 700 tons of cement per day. The quality of this cement is precisely according to American Bureau of Standards or British Bureau of Standards specifications. The Plant can be extended at a future date to bring the daily production up to a total of 1,400 tons.

Suggestions

(1) Power-alcohol - By conserving the entire molasses up to the last drop substantial quantities of it will still be left after meeting the requirements of the planned alcohol industry. The balance should be utilized for preparing levulinic, a commercial acid and a basic raw material for a large number of organic compounds of commercial value.

For storing the molasses construction of tanks are greatly needed. Because of the liquid and sticky character of the commodity its transport has been in a worse condition. Therefore, a proper supply of wagons is also required. Since the process of dehydrating molasses has very much advanced, the proper way of packing solidified molasses to prevent moisture absorption
during transport is also suggested. The quantity and the value of the sugar left every year in the molasses of the sugar factories is enormous. It should be recovered by some process. According to Dr. Klopperburg, the cost of alcohol production can be paid from the cost of sugar so recovered from molasses (p.174).

2. Glass - The production of scientific glass-ware, though good and satisfactory, needs a great deal of improvement in quality and precision. Some of the common defects e.g. non-uniformity in shape and volume, varying wall thickness, lack of proper finish, comparatively poor annealing, resulting in undue breakage in transport and storage, low thermal endurance and lack of brilliance, should be eliminated by thorough researches. The imports of foreign moulds have been restricted, while the manufacturers take larger services from the Indian made moulds. This results in inferior production and must be checked.

With regard to the economic production and efficient utilisation of the resources, the glass industry in general and the bangle industry in particular should not be allowed the undue and unscientific concentration in Uttar Pradesh especially at Firozabad, where coal is brought from a distance of 700 miles. Save from the local artisans, who inherit this art from their ancestors, there is no other advantage in expanding this industry at this centre any further. All the raw materials (except 'reh' which is used no more) come from other parts of India, which means heavy transportation charges both

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ways. Glass articles, because of their volume and fragile nature have to bear much higher rates of railway freight than the raw materials. So it seems worthwhile to export the raw materials to the marketing centres, and manufacture bangles and hollow wares.

What is still more important is to establish some correlation between the glass industry and the hydro-electric development in the State. Possibilities of the application of hydroelectric power in smelting the glass should be investigated. If it comes out successful, the glass and such other industries would readily consume the newly generated power. The industry would also be decentralised from centres like Firozabad. There is hardly any doubt that if due attention is given in this direction the State may open new avenue for exporting her production not only to adjoining states but also to foreign countries as well. More than 25 crore bulbs costing some 15 crores of rupees are imported into India annually. With the completion of the various hydro-electric projects, almost every hamlet would be lighted with electricity and this in turn would create great market for electric lamps and other allied articles.

In order to develop the glass industry, and in turn to develop scientific researches in India, it would be worthwhile to study conditions under which it has developed in other countries like England, Belgium, U.S.A. and Canada. The countries have made glasses of innumerable kinds, numbering more than there are metals and alloys combined, which they lay on a piece of ice and pour molten lead on its top side without cracking it. From glass now are made houses, furniture, kitchen stoves, and

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MAP OF SOUTHERN MIRZAPUR DISTRICT SHOWING OCCURRENCES OF RAW MATERIALS FOR CEMENT INDUSTRY WITH RELATION TO THE RIHAND DAM SITE

INDEX...
- Limestone
- Clay
- Coal

SCALE 1" to 8 Miles
centrifugal pumps, fishnet floats, sole plates for electric irons, costume jewellery, thimbles, floats for toilet flush tanks, thread guides for rollers in textile mills, spiral springs, phonograph and records. Most uncanny of all is the making of glass thread 15 times finer than human hair which can be bent like rubber, twisted like string and woven like cotton. Thus glass like shellac, a luxury of the past, is not only a necessity of the present but it is indispensable for the future too, and it has truly been called one of the triumvirate of modern industrial material.

3. Cement Factory - The branch line from Mirzapur to Chopan via Robertsganj, a distance of 62 miles, will open the southern part of the Mirzapur District and will serve a good purpose for the transport of cement from Chopan to Mirzapur and then to other parts of the country. By extending the Dehri-on-Son Rohtas light railway along the Son westwards up to Markundi a series of cement industries can be started on this line without spending much on the transport of raw materials to the factories.

The increasing cost of the gunny bags adds to the cost of the cement. The price can be brought down slightly if the Government permits import of paper-bags which can also be produced in the paper mills of the State as explained in Chapter VII (p. 219).

4. Establishing a Rayon Factory - Rayon yarn is largely required by the handloom industry of the State. Its consumption has risen from negligible quantities to 47,00,000 lbs. per annum. Mau is the largest centre of rayon weaving and consumes about
half the total yarn consumed in the State. Tanda and Banaras are the next important centres. Bara Banki, Amroha, Dhampur and Nagina also consume some amount of rayon yarn. Its approximate consumption at important centres of the State is:

<table>
<thead>
<tr>
<th>Centre</th>
<th>Consumption (lbs. per month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mau</td>
<td>60,000</td>
</tr>
<tr>
<td>Mubarakpur and suburbs of Mau</td>
<td>20,000</td>
</tr>
<tr>
<td>Tanda</td>
<td>50,000</td>
</tr>
<tr>
<td>Banaras</td>
<td>10,000</td>
</tr>
</tbody>
</table>

A rapid increase in its consumption is being noticed at present owing to increase in population and a rising standard of living. The development of rayon industry would go a long way to make good the cloth shortage and check the rising spiral of its prices.

There has not been any production of rayon yarn in the State so far. The bulk of the imports are made from Japan and Italy. But in order to give protection to the home industry the Government has imposed restriction on its imports and this in turn has raised its prices.

Rayon yarn is manufactured from cellulose pulp, which is processed from coniferous trees, mainly silver fir and spruce. As we have already mentioned in our study of forest resources (Ref. page 41, Chapter II) large quantities of silver fir and spruce can be made available from the Kumaun region for the production of pulp of a sufficiently high quality for rayon yarn and staple fibre production. This is by no means the only source of raw material for the rayon that is open to exploitation. There are many other cellulose bearing materials like cotton linters, 'ullah', 'Sabai', bamboo, hemp, reeds and bagasse in all of which the State is particularly well placed and there are the bright prospects of its becoming self-supporting.
in respect of raw materials.

A further attraction for this avenue of development of forest resources is that large quantity of process steam is required in the rayon plants and therefore this steam could first be used for the generation of power and then for the processing of rayon pulp. So a few suitable sites are suggested for the establishment of rayon plants.

The adjoining map No.35 clearly indicates from the geographical point of view, the suitability of Naini near Allahabad for the establishment of a rayon factory. This factory would depend partly on forest resources but mostly on bagasse. Banbassa (Pilibhit District) and Dehra Dun are other suitable locations, where coniferous wood can easily be supplied. In the first instance there is an advantage of a nearby consuming market, while in the second and third proximity of raw materials.

It is difficult at this stage to point out the greater suitability of any one site over the other. However, it is pointed out that the Sarda Power House (quite recently completed) and the Yamuna Valley Scheme (to be taken up in future) would supply ample power to Banbassa and Dehra Dun sites respectively. Like the paper and pulp industry, it is suggested that the wood may be converted into pulp at these two centres and then sent to the rayon factory at Naini. The figures of imports of rayon yarn and rayon fabrics for the past few years clearly warrant an immediate execution and expansion of this plan which would not only make the State self-sufficient in its cloth requirements but stop huge imports of foreign fabrics.
5. Site For Fertilizer Factory at Mirzapur

The present demand for fertilizers in the country is put in the neighbourhood of 4,00,000 tons annually, but it is expected to multiply fast in the coming years as the Indian farmer is gradually awakened to the advantages of modern methods in agriculture. The Rs. 23 crore Sindri Fertilizer Factory near Dhanbad with a production target of 3,50,000 tons of ammonium sulphate a year is the largest factory in Asia and it has gone into production only in the year 1954.

While a country like Egypt can have three plants of the Sindri capacity, why India will not go far ahead of her? So three new ammonium sulphate plants, each of about the size of Sindri, are proposed to be started during the Second Five-Year Plan. But there are at least twice the number of States taking a claim for one of them. Singal has been admitted on all hands to be an ideal site in the Panjab for a new fertilizer factory. Now Saurastra, Hyderabad, Mysore, Madras and Rajasthan are the claiments for the other two factories. The author here suggests another prospective site at Mirzapur, which, though not more suitable than Singal, is better than Sindri and others (Map No. 36).

Among the factors conducive to the installation of a fertilizer plant are:-

1. Proximity of the main raw materials:-
   (a) Gypsum (b) Coal (c) Lime-Stone.
2. Availability of cheap and plentiful hydro-electric power.
3. Arrangements for adequate water-supply.
5. Utilisation of by-products.
Fertilizer Factory at Mirzapur

(A Suggestion)

VINDHYA PRADESP

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ROADS

BROAD GAUGE

METRE
6. Extensive consuming area around the factory.

7. Ideal transport conditions.

The daily consumption of raw-materials at the Sindri Fertilizer Factory is 800 tons of coal, 600 tons of coke, 1,800 tons of gypsum and 400 tons of other materials. This shows that gypsum is the most important of all the raw materials. But Sindri does not have even an ounce of it in the neighbourhood. Practically all the gypsum is brought from Jodhpur and Bikaner, about a thousand miles away from the factory. From there it is brought to Agra on the metre gauge line, unloaded and then reloaded on the broad gauge. At Mirzapur the same raw-material can be obtained more easily, avoiding long haulage.

The largest deposit of gypsum in India is at Jamsar, 14 miles away from Bikaner. In Jodhpur extensive deposits of gypsum occur near Kurlo, Madpura near Kavas railway station and Shaker between Barmer and the Luni river. An important deposit occurs at Bhadwasi railway station, 8 miles N.N.W. of Nagaur. The Pilarwasi deposit is both extensive and of better quality.

Several large deposits of gypsum also occur in the Kumaun Himalayas near Sahasradhara, Manhara and Silkote. Likewise deposits of gypsum occur on the Nihal Nadi between Kaladhungi and Naini Tal, and also near Rishikesh. Of these deposits of gypsum within the State the first and the last are not difficult of access and are already worked to some extent. These can safely be exploited for the fertiliser plant at Mirzapur. However, no estimates of these deposits are available as yet.

The import of these deposits would, no doubt, avoid the change of gauge but it would involve the transport of raw material from the deposits to the railhead by trucks. The other important raw material is coal which again is available in the south of Mirzapur in the Singrauli Coal Fields (p. 53). This deposit, though occurs in close proximity, may not last for many years. It is already used for the Churk Cement Factory. Hence the supplies will have to be made from Jharia. This is no great disadvantage as compared to some other regions like the Panjab and Saurastra where difficulty is experienced in obtaining suitable coal from long distances. The coke can either be imported from Jharia directly or may be converted at the factory by erecting a coke oven battery as is the case with the Sindri factory. In the later case a large quantity of coke-oven gas would also be obtained from the plant and it can be put to other economic uses e.g. for the production of urea and double salt i.e. ammonium nitrate-sulphate.

As regards limestone, it is extensively found both in the Mirzapur district and the Kumaun Himalayas, and there will be no difficulty in obtaining large quantities of it (pp. 56-59), when the transport facilities are completed under the next five year plan.

The Rihand Dam project would supply 3.25 lakh Kilowatts of Hydro-Electric power which would be both plentiful and the cheapest in the whole country (p. 148). The Sindri factory is alone consuming about 40,000 Kilowatts of thermal power which is more costly than that available to the Mirzapur factory.

1. 'Hindustan Times' New Delhi, January 26, 1955.

Water is an equally important factor for the installation of a fertilizer plant which requires some twelve million gallons of water per day. Sindri had the water difficulty but the solution of the problem by infiltration of the bed of the Damodar river is the major achievement of the factory, besides the construction of the Konar Dam under D.V.C. would help Sindri to achieve the target. In the case of the factory at Mirzapur, the waters of the Ganga alone can meet the entire requirement easily.

Cheap labour too is plentifully available in the Eastern districts of the State specially in the less developed southern parts of Mirzapur District.

The utilisation of by-products is another important factor for consideration. About 900 tons calcium carbonate sludge will be thrown away daily. This can be utilised in the manufacture of first class Portland Cement. In order to make the unit an economic proposal, this sludge can be passed on to the Churk cement factory, only 51 miles away, connected both by rail and metalled road.

Since Mirzapur is located almost in the centre of the Ganga plain, large quantities of ammonium sulphate can easily be consumed in the fertile valley and can also be sent to Vindhya Pradesh, Madhya Pradesh, and Rajasthan. The construction of the Rihand Dam and many other schemes in U.P. would irrigate hundreds of lakhs of acres. This area and extensive 'usar' lands in the State would require fertilizers in increasing quantity.

The last, but not the least, important is the means of distributing the output of the factory. As the factory shall
be located on the main line of the Northern Railway which is joined with the Eastern Railway at Moghal Sarai, the factory will be connected with distant parts in the East and the West of the country. It is also connected with the North-Eastern Railway on the other bank of the Ganga. As for the roads, Mirzapur lies not only on the State highways but also on the National Highways.

In respect of other proposed sites, Mirzapur is about 700 miles away from Nangal and equal distance from Hanuman Garh near Bikaner and much farther away from Hyderabad. Thus it will have sufficient territory to command even when other sites have separate plants. Thus the location of the factory is very favourable as it gives it equally easy access, both to some of the finest raw materials as well as the consumer's markets in the most densely populated regions.

Although the assessment of their relative suitability is primarily a technical job best left to the technicians, yet under the industrial policy of the Central Government that new industrial projects should be established in economically less developed areas for a balanced regional development of the country, Mirzapur's claim becomes all the more stronger.

In case Agra is taken as an alternate site, gypsum would be available without change of gauge, power from the Yamuna valley and the Ram Ganga Projects, when they are completed in the next five-year plan and later on from the Betwa and Ken power project which may be taken up in the future, and coal would be available from Jharia. The only difficulty of this site will be the availability of large quantity of water and coal and the utilisation of sludge. These two sites may be compared and the experts should find out the greater suitability of the one over the other.
(6) Establishing Marble Industry in Mirzapur - Marble slabs for flooring is a very important building material. Important towns like Kanpur, Lucknow, Allahabad can consume good deal of marble if it can be made available at a cheaper rate. At present most of the marble used in India is imported from Italy. Besides, Makrana is an important centre where there is good marble cutting and polishing industry.

The mineral survey of Mirzapur District (p. 56) has shown that there is a good and fairly big marble deposit (Map No. 37). The marble of Bichchi Nala is hard and decorative and may produce exceptionally beautiful building material. Mallet had described parts of it as "Turque Verde Marble". Besides, the marble band occurring four or five miles north of village Gaharwar in Mirzapur District can supply a large amount of marble required for the State. It is quite white and can be used for producing nice white marble slabs which can find a market in U.P. towns. This deposit is situated 70 miles south of the town of Mirzapur and is very far away from the railway station. Under these conditions, we shall have to work out the cost of the transport of the material from that locality to Mirzapur Station.

From Mirzapur to Robertsganj, a distance of 40 miles, there is a good road and trucks can run between these two towns. From Churk deposit lies about 30 miles south and is connected by means of a goat-track on which bullocks can carry loads. It means that for 30 miles this material has to be brought on bullocks to Churk and then it can be brought either by trucks or rail to Mirzapur. Now there are two alternatives:-
1. To bring marble blocks in a raw state to Mirzapur and to cut and polish them there.

2. To cut and polish the marble on the spot and to bring the polished slabs to Mirzapur for distribution to U.P. towns.

The first proposition is not paying, because much more material has to be brought than in the second case. The cost of marble is negligible. Most of the cost is due to transport and for cutting and polishing.

The second proposition seems to be economical. The chief items of cost in cutting are power, sand, steel-blades, and water besides labour. As for the sand, it can be had easily at the spot from the nearby places at a negligible cost while water is also available in plenty. The steel-blades will have to be brought from outside. After cutting, the slabs are again finally polished, which mostly requires power and fine corundum (p. 57). There will not be the least difficulty in procuring quite cheap power from the Rihand Dam scheme.

As for corundum, large deposits occur at a distance of 10 or 12 miles from this locality at Pipra, Rewa (V.P.) Experiments have succeeded in crushing this corundum to a fine powder to make corundum wheels for cutting slabs. If these can be made here, they will be found quite cheap. Thus for the cutting and polishing industry the locality is quite good. These slabs can easily and cheaply be delivered to Mirzapur Station. Thus Mirzapur marble cutting and polishing industry can compete quite successfully with the Italian and the Makrana marbles in important towns like Lucknow, Allahabad and Kanpur. Hence this marble industry can be started in the Mirzapur District.

Inspite of minerals of little economic importance in the State, the author cannot refrain himself from emphasising the close connection between some of the prospective deposits and industrial future of the State.
INDUSTRIES RELATED TO AGRICULTURAL RAW MATERIAL

1. COTTON TEXTILE
2. SUGAR FACTORIES
3. FOOD, DRINK, ETC.
4. OIL MILLS

INDUSTRIES RELATED TO ENGINEERING

1. RAILWAY WORKSHOP
2. PRINTING & BOOK BINDING
3. GENERAL ENGINEERING, STEEL TRUNK, LOCKS ETC.
4. ELECTRICITY GENERATING & TRANSFORMING
5. COUCH BUILDING & MOTOR CAR REPAIRING
6. MISCELLANEOUS

INDUSTRIES RELATED TO MINERALS, METALS & STONE

1. GLASS
2. IRON SMELTING
3. MISCELLANEOUS
4. FOUNDRARIES
5. MINOR WORKSHOP
6. CEMENT

INDUSTRIES RELATED TO ANIMAL SOURCES

1. LEATHER & SHOES
2. TANNARIES
3. SILK
4. BONE MANURES, BRUSHES ETC.

INDUSTRIES RELATED TO WOOD

1. PAPER
2. MATCH
3. SAWING
4. MISCELLANEOUS
5. ROSIN & TURPENTINE ETC.

INDUSTRIES RELATED TO CHEMICALS

1. CHEMICALS
2. SOAPS
3. DYING & BLEACHING
4. MISCELLANEOUS.