Indian Journal of History of Science, 17 (1); 46—62

INDIGENOUS PAPER INDUSTRY AND MUSLIM ENTREPRENEURSHIP: CASE STUDY OF PAPER TECHNOLOGY AND TRADE OF AHMEDABAD WITH SPECIAL REFERENCE TO THE 19TH CENTURY

MAKRAND J. MEHTA*
Department of History, M. S. University of Baroda

It is heartening to note that Indian historians have started taking interest in the industrial development of the country.[1] But this is just the beginning and we have as yet few histories of indigenous industries and their transition to the more advanced stage or the way in which new industries were started with borrowed methods and techniques. The problem is further aggravated when we come across an area of technology and this admittedly is due as much to a historian's preoccupation with the traditional themes as to his lack of acquaintance with the sciences and their application to industry. This has precluded him from investigating and assessing some of the crucial issues of economic development of India such as: "In what way did India lag behind Europe in the post-industrial revolution period? How far was this due to the social environment and to the weakness of our own traditions? What was the role, intended or unintended of the colonial government in retarding or promoting the existing Indian technologies? How did the Indian commercial and the manufacturing groups respond to the growing western contact and also to certain economic policies of the British?"[2] One of the ways of looking at the problem is by the study of indigenous technology in the context of the changing character of western technologies. This paper is an attempt in that direction; it is a case study of the indigenous paper technology and trade of Ahmedabad with particular reference to the nineteenth century. The paper contains an appendix providing a brief descriptive account of the development of the paper technology in the European countries, particularly in the nineteenth century. This paper is based on the contemporary English and Gujarati sources and also the interviews with the city's *kagdis* or paper manufacturers.[3]

I

It is generally assumed that Kashmir and Panjab were the earliest regions in India to acquire the manufacturing skills from Persia and the neighbouring countries in the sixteenth century.[4] But if we take into consideration the trade links between the Arabs and the Gujaratis in the light of the contemporary records, we may like to revise this assumption. Nicolo Conti, an Italian traveller who visited Gujarat in the early part of the fifteenth century categorically states: "The inhabitants of

**Present address:* Department of History, Gujarat University, Ahmedabad 380009

Cambay alone use paper; all other Indians write on leaves of trees of which they make beautiful papers."[5] The Arab contact with Gujarat had started almost simultaneously or soon after they are said to have acquired the art of paper-making from the Chinese in 751 A.D. The Arabs had regular settlements in Cambay, a renowned port-town in medieval times, at least since the thirteenth century.[6] They had also a small settlement at Kocharab, a village adjacent to Ahmedabad, after the latter's foundation by Sultan Ahmad Shah in 1411. It is likely that the Arab settlements may have antedated the founding of Ahmedabad, but we know little about this. The Kocharab village, now a part of the Ahmedabad city emerged as a paper-manufacturing centre, and even though the traditional manufacturing has totally disappeared in Ahmedabad now, it is significant that a number of *kagdi* families still inhabit the Kochara area of the city. It is also significant that the local Muslims still believe in the tradition that the Arabs had had their settlement at Kocharab on the banks of the Sabarmati river and that the term "Kocharab" is a corruption of the word Kuch-i-Arab, which means the settlement of the Arabs.[7] I have not come across any direct evidence regarding the Ahmedabad paper manufacturing industry for the fifteenth and the sixteenth centuries, but it is probable that the Arab contact with Gujarat first as traders and then as invaders and immigrants enabled Ahmedabad to acquire directly the paper making technique and not through Persia and North India. There was a regular trade nexus between the Persian Gulf region, Cambay and Ahmedabad. Thus in view of Conti's above statement and also the emergence of Ahmedabad as a paper manufacturing centre in the seventeenth century as we shall see, the existence of the paper industry in Ahmedabad prior to those of northern-most regions of India, cannot be easily ruled out. If this were so, then the historians and the social anthropologists may tend to shift their focus from Jhelum to Sabarmati. But this is only an inference and the problem requires serious investigation before we establish the validity of my hypothesis to any reasonable degree of certainty.

The records of the European East India companies which started their trading operations in India in the seventeenth century make frequent reference to the papers manufactured in Ahmedabad. The first reference in the English company records is dated February 26, 1619. It states that the goods exported from Ahmedabad to Persia included the writing papers[8]. It seems that Ahmedabad had a substantial market in the gulf region. In 1668-69 the company's factors at Surat had requested their Ahmedabad counterpart to supply the papers, probably for export[9]. The Ahmedabad paper which was in great demand in Gujarat for a variety of business purposes naturally constituted an important part of the intra-Gujarat trade[10]. It was also exported to Rajasthan and Central and North India. The paper manufactured was "exceedingly white and glossy" and was reckoned as one of the best in the country.[11] Ali Muhammad Khan who wrote his magnum opus, *Mirat-i-Ahmadi* in the 1760's states that the papers made in Ahmedabad were superior in quality to those of Kashmir and Daulatabad.[12] Though it is neither possible nor within the scope of this paper to assess the quality or the varieties of the Ahmedabad papers as com-

pared to those of the other regions, the fact that Nowshera (Kashmir), Sialkot (Punjab), Sanganer (Rajasthan) and a number of other towns and cities in northern India[13] had a centuries-old paper making tradition suggests that the market for the Indian paper was competitive. The well established inland trade routes linking Ahmedabad with major urban trading centres of the north and the south and the city's proximity to the ports of Gujarat facilitated the internal trade of Ahmedabad.

Ahmedabad produced different varieties of papers. The papers used for the accounts and the legal purposes were thick, coarse, and durable, the proportion of *san* as a raw material being greater than the other materials in the manufacturing process. The papers used for writing letters were rather thin and glossy and were mostly made out of paper and *san* clippings.[14] The local manufacturers used discarded *san* cloth, hemp, papers, fishermen's nets and such other fibrous substances as contained a good element of cellulose. John Van Twist, chief of the Dutch factory wrote in 1638 that Ahmedabad imported raw materials from the Malabar port as well as the Portuguese ports of Diu, Daman, and Goa, the chief imports from the Portuguese ports being the fishermen's nets.[15] That Ahmedabad continued its manufacturing tradition in the subsequent century could be seen from Ali Muhammad Khan's work cited above. Though we do not have any direct evidence about the manufacturing process in Ahmedabad, we have an eighteenth century data for the other region. In view of the fact that there were no major differences in the paper manufacturing techniques in the various regions of the country. Ironside's account[16] published in 1774 could be applied to Ahmedabad. This is also the first systematic and detailed account about the manufacturing process in India. Ironside states that though the raw material was hemp and *san*, Indians hardly used fresh material which could have yielded much better fibres. On account of the poverty of the Indian *kagdis* or because of the low cost of the used goods they used old and discarded ropes, *san* clothes, and nets.[17] These *san* rags were cut up into small pieces, macerated in water for about five days, washed in the river in the basket, and "thrown in a jar of water lodged in the ground; the water being strongly impregnated with lixivium of sedgi-mutti [crude carbonate of soda] six parts, and quicklime seven parts". Ironside adds: "After remaining in this state eight or ten days, they are again washed, and while wet broken into fibres, by a stamping lever, and then exposed to the sun, on a clean terrace built for this purpose; after which they are again steeped into fresh lixivium as before. When they have undergone three operations, they are prepared for making paper of a tolerable whiteness."[18] The pulp thus produced was taken up on a "fine wire frame just as in the English manner."[19] As we shall subsequently point out, the "wire" used in Ahmedabad—and also in the other parts of the country—was not made of metal as was common in Europe in the seventeenth century.

Ahmedabad continued its paper manufacturing activities in the nineteenth century, though the city's *kagdis* suffered from the adverse economic policies of the British to whom Gujarat had passed over in 1818. Referring to the paper manufacturing industry of Ahmedabad, H. G. Briggs, an English traveller noted in 1847:

"These Kadies at one time realized handsome dividends by the use of the government stamp, which has since been withdrawn from them."[20] Later on, during the tenure of Charles Wood as the Secretary of State for India in the 1850's an order was passed that all the paper requirements of the government of India be supplied by Great Britain. These measures, as George Watt observes, "threw back very seriously the growing Indian production."[21]

Though the Ahmedabad *kagdis* like their counterpart in the other regions of the country suffered a setback both on account of the adverse economic policies of the British Indian government and the explosion of the machine-made paper products from England, Ahmedabad withstood the competition. Around the middle of the nineteenth century local *kagdis* introduced innovation in the manufacturing process which served as a labour saving devise. Maganlal Vakhatchand who published his *Amdavadno Itihas* in 1851 says that the innovation and its successful implementation in the "paper-making process has enabled (the *kagdis*) to emply one worker in place of four workers" which was the case before.[22] We do not know what was the nature of this innovation and how it helped the local *kagdis* to reduce cost and to withstand the growing competition. But there is little doubt that the innovation, to the extent to which it saved labour and cost, was entrepreneurial in the Schumpeterian sense.[23]

An interesting feature of the Ahmedabad paper industry in the mid-nineteenth century was that the manufacturing and the marketing functions were entirely managed by the diverse social groups among the Muslims; manufacturing was controlled by the immigrant Muslims whereas marketing was controlled by the Sunni Vohras. The Ahmedabad Muslims, like those in the other parts of Gujarat, were divided into two main strains. An official account published at the end of the nineteenth century states that the Gujarat Muslims were divided into two main sections, namely those who had a foreign strain and those who were almost entirely of local Hindu descent. The "foreigners", or to use a correct term, the immigrant Muslims, comprised Syeds, Mughals, and Pathans, and Arabs.[24] They also included the various Muslim communities known generally as "Shaikh."[25] E. G. Fawcett, the collector of Ahmedabad in the mid-nineteenth century wrote that the paper-manufacturing industry of Ahmedabad was completely controlled by the immigrant Muslims. They had their *mahajan* which cut across the caste line. This was distinctly called *kagdini Jamat* whose members were "bound by common interest to keep secret the mysteries of their craft."[26]

The trading and the marketing functions of the Ahmedabad paper industry were managed by the Vohras. That the Vohras were a professional and a skilled commercial community of Gujarat is attested to by a number of foreign and Indian travellers and scholars. As early as the sixteenth century they had developed business links with the gulf regions.[27] James Forbes who lived in Gujarat for many years in the later part of the eighteenth century observed: "The boras are not only considerable

traders in commercial towns but are the chief travelling merchants in Gujarat and the western part of India; going about like the Jews in Europe with boxes of different commodities..... The English considers them as Mussulman Jews."[28] The Vohras have had been the Muslim converts from the Hindus. "The name Vohra", Misra points out, "can be said to stand not for any single community but for several whose broad similarity is that they are mainly of indigenous origin. Undoubtedly, a number of other communities are also indigenous but their special character, for instance, of being recruited from a particular Hindu caste or community has given them an individuality."[29] Misra also seems to suggest that historically the persecution of the Vohras by the Muslim ruling elites at various periods of time led to their growing attachment to wealth and social status through commercial operations.[30] But whatever the causes of their commercial-orientation, the Vohras completely dominated the marketing of the paper products of Ahmedabad. They were wholesale paper merchants having about fifteen large warehouses in the Kalupur area within the city gate. They exported the paper products "to the north as far as Pahlunpoor; to the west as far as Bhooj and Mandvee, and the whole of Kathiawar; and South to Bombay.... Large quantities are exported to Baroda, and a small quantity into Malwa, Indore, Ujjain, and Rutlam."[31]

The papers which Ahmedabad manufactured and exported were of different varieties distinctly known as "sahebkhani", "mahmud shahi", "khambhati", "barigoria", "karchi", and "gasia". The *sahebkhani* were a superior variety and cost "twenty to twenty-four annas a quire" in 1847. The *barigoria* which were of inferior quality fetched only three annas per quire.[32] Ahmedabad also produced thick white papers ornamented with gold. They were used for writing complementary letters and invitations by persons in rank and wealth. These papers had a large export market in the Muslim countries, particularly in the gulf regions, Arabia and Turkey. Even as late as 1886 these fashion papers were in demand.[33] The various qualities of papers show that the Ahmedabad entrepreneurs had a good insight into the various requirements of their customers.

The artisan paper industry of Ahmedabad since the very early times does not seem to be a simple family affair. Its operations show some elementary capitalistic features in the craft. In the first place the workers worked for wages.[34] The employer supplied the tools and the raw materials to the workers.[35] Briggs who visited the "paper-manufactory" in the Shahpur ward of the city in 1847 says that the industry gave an employment to 1,000 to 1,500 persons—men, women, and children.[36] Briggs does not seem to have visited the "manufactories" in the Kocharab area and it is likely that his figures do not include the paper workers of Kocharab. Secondly, the manufacturing process, as we shall subsequently see, involved skill-specialization as well as division of work. The raw material for manufacturing papers was supplied both locally and from outside. The nineteenth century account states: "Much of this [raw-material] is brought by Vangaras [caravans] from Marwar."[37] The Vanjaras supplied mainly the old gunny bags and sackings. But the paper manufacturing and

marketing functions, as we have pointed out, were diffused, the Sunni Vohras possessing great commercial acumen handling the latter function.

II

This section deals with the basic technological features of the indigenous paper industry of Ahmedabad in the nineteenth century. They are discussed under the following headings: (1) Raw materials (2) Tools and Equipments, and (3) Manufacturing Process.

Raw materials

The Ahmedabad paper manufacturers used paper cuttings and the old books particularly in the latter part of the nineteenth century. The growing number of printing and book-binding establishments in Gujarat facilitated the use of discarded newspapers, books, journals, etc. The use of fishing nets, *san*, and "Bengal hemp and ganni threads"[38] was quite common. But the cotton piece goods and waste were conspicuous by their absence. This was in spite of their higher cellulose value. The papers made from cotton waste and cotton clippings were already known for their durability. In view of the growing number of textile mills in the city (26 mills in 1899), it is surprising that the *kagdis* did not try out the products discarded by the mills as "waste". Nor did they use the old and discarded clothes. The problem why the *kagdis* did not have any use for cloth clippings will always remain a mute one in the absence of historical evidence. The cost consideration might have served as a negative factor. The field work is still possible and this might provide some historical clues.

Tools and Equipments

One of the essential tools of the Ahmedabad paper manufacturers was a wooden pastle of "rule construction."[39] The workers pounded the raw material in a stone vat fixed and plastered in the ground. This pestle was hand-operated and was in use for the past few centuries. But probably in the 1840's the *kagdis* introduced a new stamper consisting of a long wooden horizontal lever. The fulerum which was almost in the middle of the lever rested on two pivots. A cylindrical piece of wood was attached vertically to one end of the lever. The iron hammers or beaters were fixed at the bottom of the stamper. In principle, this new stamper was nothing but a mortar and a pestle worked by a lever. But though simple, this new device saved labour. It was also less fatiguing than the older instrument as it allowed workers to tread upon the tilt bar letting the hammer fall upon the stone mortar containing raw materials. The strokes were more rapid and continuous than the hand operated pestles. Maganlal Vakhatchand probably alludes to these innovations in 1851. The new stamper became vogue in Ahmedabad in the latter half of the nineteenth century.

The most important tool of the Ahmedabad paper makers was a mould, a "close matting drawn upon a frame" in the words of Briggs.[40] The function of a mould was

to form a paper by suspending water from the pulp. This was the most specialized part of the profession. The mould consisted of two distinct parts, namely, the mould-frame and the mould-cover. The mould-frame consisted of about twelve pieces of wood with two extra deckle sticks used as side deckles. Four of the twelve pieces represented the actual frame of the mould. The remaining eight were composed of ribs, or cross-bars of the mould frame. The four outer frame sections were morticed at the corners making a square resembling a plain picture frame. Between the top and the bottom sections of this square were placed the right triangular shaped ribs, causing the four sided frame to take on the appearance of a barred window. The ends of the eight triangular ribs were morticed at regular intervals into the outer frame-work. The function of the triangular shape of the ribs was much more than a mere support for the fragile and flexible mould-cover; when the macerated pulp was taken into the mould, the wooden frame with the triangular-shaped ribs, formed a suction box with a three quarter with vacuum which greatly assisted in the withdrawal of the water from the newly-formed sheet of the paper. The mould-frame called *khashi* in Ahmedabad was made from the deodar wood as it did not bend or swell by the touch of water.[41]

The mould cover of Ahmedabad like that of Kashmir was composed of many lengths of dried grass laid side by side and laced together at interval with horsehair. The weaving of the grass mould required considerable dexterity, if not so much ingenuity. The grass required to manufacture the mould-covers did not grow in Gujarat, and the Ahmedabad *kagdis* imported this equipment as well as mould frames from north India.[42]

Stones and Boards

The sheet which formed upon the surface of the mould-cover was full of water. The function of the stones and boards was to expel the surplus water from the sheets. For this purpose the sheets were placed "between two stout boards, over which is a couple of heavy stones".[43]

Marble Roller

The function of this tool was to give polish and smoothness to the paper. This also eliminated, to some extent, the rough foreign particles and knots of fibre that found their way into the pulp.

Manufacturing Process

A number of Gujarati sources in the late nineteenth century describe the paper manufacturing process.[44] The first step was the cutting of the raw materials such as *san*, hemp, fishing nets, and paper clippings from the book-binding establishments. The fibres from the cut raw material were loosened by thrashing them with a mallet and were shaken to remove dust. These fragments were then sorted out in different sacks and soaked in the various proportion in a *kundi* (a stone structure for storing water) in order to be fermented in the fresh water. In the case of the rough *san* products *chunam* (lime) and *sajji khar* were mixed with water. These mild alkaline agents gave a

chemical treatment and easily separated cellulose from the non-cellulose matters such as resins, gums, and waxes. After this disintegration process the raw pulps made from the different raw materials were brought to the stamper where they were beaten into pulp. This action separated the fibres. The *kagdis* then took the pulps covered in sacks to be washed in the Sabarmati river, less than a furlong from the factory. The washing was done in the following manner. Two persons stood facing each other. Around each of their waists two of the four corners of a large coarsely-woven cloth were tied. This formed a good-sized bag hanging between the two men, a hammock-like receptacle in which the partially-beaten pulp was placed. Holding the bag under the water of the river the persons agitated the pulp in the bag until considerable dirt and alkaline residual was eliminated. In order to clean the pulp perfectly the workers placed the bags containing pulp on a nearby bed and rubbed the bags against the matted coir ropes of the bed, adding the river water according to the requirements. The fibres were then squeezed and pressed into the cakes (*joli* process) by tightening the cloth about the mass, the water discharging through the meshes of the fabric. The mass was then pounded under the stamper till it was reduced to pulp. The pulp underwent a test to check whether any unnecessary particles containing non-cellulose matters were not left in it. For this the pulp was poured into a clay *lota*, and shaken vigorously. A sample of pulp was then taken in the palm. If it showed any particles, it went again to a stamper to be reduced to the proper pulp. The country soap, which the *kagdis* imported from Prantij (then in Ahmedabad district) was finally mixed with pulp. This served as a bleaching agent and removed whatever dust was left in the pulp. The pulp was now made into cakes and kept in heaps.

The cakes were next put into a small cylindrical reservoir (*kundi*) which was close to the vat and mixed with water to have the consistency of gruel and trodden with feet so as to separate the lumps. This was transferred to the adjoining vat containing water. It was then stirred with a stick by a worker and left at rest overnight.

The process of paper lifting from pulp which required real skill started the next morning. The vatman sat at a place facing the vat and placed two bamboo sticks (deckles) across its length and breath and at right angles to each other. Next he took the mould-frame and placed it in such a way that the horizontal side rested on the ridged brim of the vat in front of him while the other side rested on the bamboo. He then placed the mould-cover on the frame in such a way that the grass stalks were at right angles to the ribs of the frame, the horse hair or chain lines being parallel to them. The vatman then took the two wooden bars and stir the water in the vat just to bring some of the pulp to the surface. The bars were now quickly placed on the mat in such a way that with the round bars they formed a rectangular shallow basin or deckle in which the pulp was taken to form the sheet. Afterwards he raised the frame from the opposite side and quickly removed the bamboo and placed it aside, so that it would not obstruct the operation of lifting the paper. The vatman next held the frame in his hands in such a way that his thumbs and fore-fingers pressed against the two loose rectangular bars while the rest of the fingers pressed the frame from underneath.

Next he dipped the frame almost vertically into the vat and turning it horizontally in his hands, took some of the pulp on the mat and brought it to the surface of the water and immediately began to level it on the mat by shaking it to and fro. Any excess pulp was allowed to flow away from the opposite side of the frame. This required judgment on the part of the vatman. While the water was draining away from the pulp he gave to and fro vibrating motions to the frame. At the same time the two thumbs gently struck against the two loose rectangular *pattis*. This vibrating of the frame was done from all sides or directions. This helped to felt or intertwine the individual fibres in the pulp, making the paper strong. The vatman then carefully lowered the frame in its horizontal position just a little into the water. He floated the pulp layer on the mat from all sides and, by giving slight jerking motion here and there, adjusted the uniform thickness of the paper layer. If he wanted a thicker paper he repeated the process of taking out another layer of pulp over the first one and all the subsequent operations of vibrating were done as before. This was called the double layering of pulp, or in the *kagdis's* language *do panika kagaz*. This double layering gave additional strength to the paper.

Afterwards the vatman raised the frame, and resting it on the brim of the vat quickly replaced the bamboo in its original position, and placed the opposite side of the frame resting on this bamboo. The two loose rectangular *pattis* were then removed and the wet sheet was given a fold from the opposite side by turning the mat by about 1/4th of an inch and pressing it with the round bar. This facilitated the easy separation of the wet sheet from the mat. The vatman then raised the mat with the pulp layer on, from the side in front of him with his right hand and holding the opposite side with the left hand couched the wet sheet on a piece of cloth or a mat over a wooden board. After placing the wet paper on the wooden board the vatman replaced the frame and the mat over the vat as before and repeated the operation of paper-lifting and couched this second paper layer over the first one. The papers were formed into the piles, each pile consisting of twenty-four sheets.

These piles were carefully taken out and placed between the wooden boards to be pressed. The heavy stones, as already pointed out, drenched the water from the paper. To give extra pressure children were made to tread on stones. After the papers dried the workers applied some alum and lime water to give whiteness and then stuck them on the walls for drying. Brushes were used in applying paper to the walls which were specially plastered with a coating of lime mortar. The wall pasting not only helped the papers to dry but also to bleach; the sun rays wiped off whatever scares were left on the surface of the paper. The next operation was sizing. This was very necessary as it would prevent the spread of ink while writing. The degree of sizing depended upon the purpose for which the paper was used. The size was prepared by soaking wheat for about two days and extracting the milk which was boiled with the required amount of water, alum, and copper sulphate. The paste was applied to sheets by a soft brush or a piece of cloth. The sizing process made the paper non-absorbant to inks. The blotting papers did not require any sizing as they functioned as absorbants.

Even after the paper was dried and sized, it was not fit enough for writing as the surface was rough and uneven. The paper required to be polished and made even for smooth and easy writing. Before polishing, the sheets were cleaned by rubbing the surface with pumic stone or by rough cloth to remove the particles of wood, dust, and sand. A marble stone or a conch shell was used to give a strong rub to the paper. The paper was placed on the concave board and rubbed lengthwise by means of a stone or a conch shell. This gave a polishing.[45]

H. G. Briggs has given a vivid description of the entire process as he witnessed at Ahmedabad in 1847. He writes: "The article (paper) manufactured is of rather a primitive feature, but is strong and glazed, resembling similar material manipulated in Persia and north-west provinces of India. From a thousand to fifteen hundred heads are daily employed in saturating the bleached and putrescent Bengal hemp, ganni thread &c., for the final preparation; with which at a subsequent stage is mixed a quantity of wheat starch; the gelatinous mass is then received upon a close matting drawn upon a frame very like that used by ladies in Berlin work. Sheet after sheet is thus taken off at the rate of forty an hour; when, the day's labour is introduced between two stout boards, over which a couple of heavy stones are placed to wring off the superfluous water. So soon as weight and heavy stamping have effected what is believed to be the desired result. Women are employed to separate the sheets, which are then secured to the walls of habitations of people engaged in this particular business. Upon being dried, the paper is removed and undergoes the operation of receiving that highly glazed appearance which it possesses by a marble roller being smartly drawn over an angular concave surface."[46]

The papers were polished by workers who were specially trained for this job. They were known as *morkash* and they did this job on a contract basis. They have had their own residential area in Ahmedabad called *morkashvad*.[47] This shows the importance of paper polishers in the paper manufacturing process. After polishing, the paper was ready for cutting into several sizes and to be sold in the market.

III

The indigenous paper industry of Ahmedabad passed through a severe crisis in the latter part of the nineteenth century. This was as much due to the absence of protection and the competition from the British machine-made paper products as to the inability of the indigenous industry to introduce the necessary changes in the business organization and the manufacturing methods. This could have reduced the price and improved the quality of papers. But this was not to be. The local customers often complained that the Ahmedabad papers were not only more costly but also inferior in quality as compared to the papers imported from Great Britain.[48] Occasionally the papers contained the particles of sand on account of the carelessness of the *kagdis*. During the process of manufacture, particles of sand got into the pulp; these came out

while the paper was being burnished. This damaged the paper by making imperceptible holes in it.[49]

Notwithstanding the drawbacks of the indigenous methods, this was not the only way to cope up with the adverse situation. To those who do not give enough importance to the nature of the indigenous entrepreneurship in general and the Muslim entrepreneurship in particular, the example of Ahmedabad is a revealing one. Around 1873, the paper-manufacturers of Ahmedabad took up a challenge by setting up a steam-operated paper mill, the first paper concern on modern lines ever floated and managed by Indian capital and expertise.[50] We do not know at this stage about the magnitude of this enterprise. But the evidence about the paper mill at Surat, which started its operation on January 1, 1877 provides some clues about the Ahmedabad venture. Surat was a great urban commercial city having a tradition of indigenous paper manufacturing. The industry was monopolized by the Muslims. In 1877, a Muslim entrepreneur, Jamaludin Muhammadbhai, set up a paper mill with two steam-factories and two engines employing about fifty persons daily. The paper mill used the same raw materials—*san*, hemp, sackings, rags, etc.—as were used at the artisan level. But the outturn was much greater, the average daily production being about five-hundred pounds per day. The papers manufactured by the Surat paper mill had a ready market throughout Gujarat.[50]

The Ahmedabad paper mill, one could surmise, operated successfully, until the fatal flood of September 23, 1875, swept off the plant and machinery from the Shahpur area where it was located. The machinery was rescued and set up at the Shahi Bag area of the city, but strange enough, "it was found not to pay and has since (September 1875) been closed.[51]"

Notes and References

[1] The growing interest of the Indian historians and social scientists in the industrial development of the country is expressed in several forms such as biographies of the captains of industry, and the history of the companies and industries. The following works could be cited to show this interest. S. D. Mehta, *The Cotton Mills of India: 1854-1954* (Bombay, 1954); Sunil Kumar Sen, *The House of Tatas: 1839-1939* (Calcutta, 1975); F. De Souza, *The House of Binny* (Madras, 1970); Arun Joshi, *Lala Shri Ram A Study in Entrepreneurship and Industrial Management* (New Delhi, 1975); Ashok V. Desai; "The origin of Parsi Enterprise", *Indian Economic and Social History Review*, V. No. 4 (December, 1968), pp. 307-18; J. P. De Souza, *History of the Chemical Industry in India* (Bombay, 1961).

[2] For further discussion see, A. Rahman and others, *Science and Technology in India* (Delhi, 1973) pp. 9-10.

[3] Though many Muslim families in Ahmedabad still bear the professional family name or surname of *kagdi*, none of them is engaged in the paper manufacturing profession.

[4] Hunter states that modern paper was invented in China in the second century A.D. This art remained confined to China until the Arabs conquered it from the Chinese prisoners in 751 A.D. From Samarkand the art spread southward to Persia and from thence to Kashmir and other parts of India. For details see Dard Hunter, *Papermaking the History and Technique of an Ancient Craft* (London, 1957), 475; Dard Hunter, *Papermaking by Hand in India* (New York, 1937),

pp. 12-13. For similar views see, George Watt, *A Dictionary of Economic Products in India*, 6 Vols; 5, Part 1 (London, 1892), p. 105; S. P. Ahuja, *Paper Industry in India Report and Directory* (New Delhi, 1976), pp. 51-53.

[5] Quoted by George Watt, *The Commercial Products of India* (London, 1908), p. 863.

[6] M. S. Commissariat, *A History of Gujarat Including a Survey of its Chief Architectural Monuments and Inscriptions*, 2 vols; 1 (Bombay, 1938), pp. 24-25; Ratnamanirao Bhimrao Jote, *Khambhatno Itihas* (Ahmedabad, 1935), pp. 32-44, 107-08; Narmadashankar Bhatt, *Khambhatnun Sanskritik Darshan: Sarvasangraha* (Cambay, 1976), p. 39.

[7] Ratnamanirao Bhimrao, *Gujaratnun Patnagar Amdavad* (Ahmedabad, 1929), p. 227.

[8] William Foster, *The English Factories in India 1618-21*, Thirteen Vols. (Oxford, 1906-1927), pp. 75-76, 142. Henceforth cited as *EFI* with appropriate years.

[9] *EFI*, 1668-69, p. 74.

[10] Surendra Gopal, *Commerce and Craft in Gujarat 16th and 17th Centuries A Study in the Impact of European Expansion on Pre-Capitalist Economy* (New Delhi, 1975), pp. 94, 97, 101, 173, 217.

[11] *Ibid.*, S. A. K. Gori, and A. Rahman, "Paper Technology in Medieval India", *Indian Journal of History of Sciences*, Vol. 1, No. 2 (November, 1966); Walter Hamilton, *Geographical, Statistical & Historical Description of Hindostan and Adjacent Countries* (London, 1820), p. 696.

[12] Quoted in Bombay Government, *Gazetteer of Bombay Presidency Gujarat Population Musalmans and Parsis*, Vol. 9 Part 2 (Bombay, 1899), p. 74. Henceforth cited as, *Gujarat Gazetteer*.

[13] For details see Hunter, *Papermaking by Hand in India*, *op. cit.*, pp. 1-44.

[14] The famous *Nagarsheth* family of Ahmedabad has preserved the various types of documents beginning from the seventeenth century. These documents show a variety of papers manufactured in Ahmedabad. The *Nagarsheth* records are a private collection presently under the possession of Miss Priyamvadaben Nagarsheth and Miss Pramilaben Nagarsheth, Drive-in Cinema road, Navarangpura, Ahmedabad 9.

[15] Gopal, *op. cit.*, p. 97, 217.

[16] Watt, *op. cit.*, p. 864.

[17] *Ibid.*

[18] *Ibid.*

[19] *Ibid.*

[20] H. G. Briggs, *The Cities of Gujarashtra: Their Topography and History Illustrated in the Journey. A Recent Tour with Accompanying Documents* (Bombay, 1849), pp. 266-67.

[21] Watt, *op. cit.*, p. 866.

[22] Maganlal Vakhatchand, *Amdavadno Itihas* (Ahmedabad, 1851) pp. 138-39.

[23] An entrepreneur is essentially a businessman but a businessman with a difference. The most commonly accepted traits of an entrepreneur are associated with the innovative function. Schumpeter states that the innovative uses of production function, in the broad sense, is the hall mark of entrepreneurial process. For details see Joseph Schumpeter, *The Theory of Economic Development* (Cambridge, Mass., 1949), pp. 65-67.

[24] *Gujarat Gazetteer*, op. cit., pp. 1-18.

[25] "The term Shaikh", Misra writes, "can cover a community of no definite origin; more precisely, since an individual can call himself a Shaikh and since this epithet can be claimed by any person of uncertain caste, groups of persons who have no definite associations can be covered by this term." S. C. Misra, *Muslim Communities in Gujarat Preliminary Studies in the History and Social Organization* (Bombay, 1964), p. 115.

[26] "Report on the Collectorate of Ahmedabad by E. G. Fawcett", in *Selections from the Records of the Bombay Government*, No. 5, New Series (Bombay, 1854), pp. 80-82. Henceforth cited as *SRBG*.

[27] Gopal, *op. cit.*, p. 15.

[28] James Forbes, *Oriental Memoirs*, 3 vols., 2 (London, 1813) pp. 227-28.

[29] Misra, *op. cit.*, p. 122.

[30] *Ibid.*, p. 25.

[31] SRBG., *op. cit.*, pp. 80-82.

[32] Briggs, *op. cit.*, pp. 266-67. Bombay Government, *Gazetteer of the Bombay Presidency: Ahmedabad*, vol. 4 (Bombay, 1879), pp. 133-34. Henceforth cited as *Ahmedabad Gazetteer.*

[33] Edward Bayley, *The History of India as Told by its Own Historians The Local Muhammadan Dynasties of Gujarat* (London, 1886), p. 4.

[34] *Ahmedabad Gazetteer, op. cit* pp. 133-34. My information is also based on my interviews with Shri Abdul Rahman, affectionately called Rahmanji Kagdi, on August 14, 1979, and September 7, 1979. Rahmanji, seventy years old, started his career as a paper-manufacturer in his family firm in 1917. His forefathers were also in the same profession. Shri Rahman lives in Rajajini Pol, Ahmedabad.

[35] *Ibid.*

[36] Briggs, *op. cit.*, pp. 266-67.

[37] Ahmedabad Gazetteer, *op. cit.*, pp. 133-34.

[38] Briggs, *op. cit.*, pp. 266-67.

[39] SRBG, *op. cit.*, pp. 80-82.

[40] Briggs, *op. cit.*, pp. 266-67.

[41] Interview with Shri Abdul Rahman and Shri Abdul Rahim, Rajajini Pol, Ahmedabad on September 8, 1979. The description of the mould-frame and the mould-cover by my informants fits so well with the description of the Kashmir and the Punjab tools by Dard Hunter that it leads me to believe that the Ahmedabad *Kagdis* imported the moulds from the north or from the Arab Countries in the early period. Shri Rahman informed me that Ahmedabad never manufactured these equipments. I have occasionally borrowed the language of Dard Hunter to be precise about the technical description of these equipments.

[42] *Ibid.*

[43] Briggs, *op. cit.*, pp. 266-67.

[44] For details see, *Buddhiprakash*, April 1894, pp. 117-19; Bhavanishankar Joshi, *Pardeshi Mal Apana Deshma Taiyar Thava Sha Upay Yojva Joiye ?* (Ahmedabad, 1884), pp. 35-36. Annonymous, *Deshi Karigarine Uttejan*, 2 vols; 2 (Ahmedabad, 1877), pp. 143-44.

[45] In describing the manufacturing process I have drawn heavily from K. B. Joshi's well-known book on paper-making. For a complete description of paper-making in India see K. B. Joshi, *Paper Making* (*As a Cottage Industry*) (Wardha, 1947); Jayantkumar Yagnik, *Kagal* (Baroda, 1941).

[46] Briggs, *op. cit.*, pp. 266-67; Buddhiprakash *op. cit.* pp. 117-19.

[47] Interview with Shri Rahmanji and Shri Abdul Rahim on September 8, 1979.

[48] *Prajabandhu*, February 4, 1906. p. 13.

[49] Bayley, *op. cit.*, p. 4.

[50] Bombay Government, *Gazetteer of the Bombay Presidency, Gujarat: Surat and Broach*, vol. 2 (Bombay, 1877), p. 179; *The Times of India*, May 4, 1876, p. 3. The earliest paper mills in India were started only in the late 1870's and the 1880's such as The Upper India Couper Mills Co., Lucknow (1878), The Titaghur Paper Mills Co., Calcutta (1882), The Deccan Paper Mills Co., Bombay (1887), and the Bengal Paper Mills Co., Calcutta (1889). For the early paper mills see Kothari & Sons, *Investors Encyclopaedia* 1952-53. *Seventeenth Edition* (Madras, 1954) pp. 977-91; George Watt, A Dictionary of Economic Products, *op. cit.*, p. 106.

[51] Ahmedabad Gazetteer, *op. cit.*, p. 308; For details of the flood and its effects on the trade and industry see, *Buddhiprakash*, November 1875, pp. 253-60.

[52] For further details, see *Ibid*, pp. 1-4, 7, 11-13; *Baree Doab Canal Revised Estimate 1856.* paras 13-15, pp. 4-5; *Report on the Administration of the Punjab for the Years 1849-50 and 1850-51*, paras 356-60, 364, 367, pp. 136-40; *Report on the Administration of the Punjab 1851-52 and 1852-53*, paras 424, 434-37, pp. 169-70, 176-79; *Gurdaspur District Gazetteer 1883-84*, pp. 8-9; and *Gazetteer of the Punjab Provincial Volume 1888-89*, pp. 236-40.

[54] *Report on the Administration of the Punjab and its Dependencies for 1897-98*, para 598, p. 225.

[55] *Report on the Administration of the Punjab 1851-52 and 1852-53* paras 426-27, pp. 170-71.

[26]Captain C. Minchin, *Memorandum on the Biloch Tribes of Dera Ghazi Khan District*, pp. 11, 16, 20, 55-56.

[27]*Ferozepore District Gazetteer 1883-84*, p. 9; *Ferozepore District Gazetteer 1915*, pp. 186-88.

[28]*Report on the Administration of the Punjab and Its Dependencies for 1897-98*, paras 631, 636, pp. 233-34.

[29]*Karnal District Gazetteer 1918*, pp. 9 & 199.

[30]Banerjee, Himadri, *Agrarian Society of the Punjab 1849-1901*. pp. 77-82.

[31]Douie. James, *The Punjab, North-West Frontier Province and Kashmir*, pp. 48, 241.

[32]Vij B. Dass, Co-operation in Punjab; *A History of the Progress of the Co-operative Movement from 1904-05 to the Year of Grace*, Punjab Co-operative Union Ltd., Jullundur, 1959, p. 41.

[33]*Report on the Administration of the Punjab and Its Dependencies for 1897-98*, para 464, p. 160.

[34]*Gazetteer of the Punjab Provincial Volume 1888-89*, pp. 249-56.

[35]See for instance *Rohtak District Gazetteer 1910*, p. 99.

[36]Amritsar District had an efficient drainage system. See *Amritsar District Gazetteer 1947*. pp. 6-9.

[37]*Imperial Gazetteer of India Provincial Series, Punjab*, Vol. I, p. 62.

[38]Ian J. Kerr, "The Agri-Horticultural Society of the Punjab, 1851-71", *Essays in Honour of Dr. Ganda Singh: Punjab Past and Present* (ed. N. G. Barrier and Harbans Singh). Punjabi University, Patiala 1876, pp. 252-72. The Agri-Horticultural Society of the Punjab was organized on 16 May, 1851 at Lahore with Henry Lawrence as president. It was primarily a body of the European officers.

[39]*Report on the Administration of the Punjab 1851-52 and 1852-53*, para 470, p. 192.

[40]Ibid, para 471, pp. 193-94.

[41]*Report on the Land Revenue Settlement of Kangra District 1865-72*, para 16, p. viii.

[42]*Kangra District Gazetteer 1883-84*, Vol. II, pp. 60-61.

[43]See *Report on the Administration of the Punjab and Its Dependencies for 1897-98*, para 464, pp. 159-60; and *Bannu District Gazetteer 1907*, p. 65.

[44]*Third Report of Indian Territories From Select Committee of the House of Lords Session 1852-53*, Appendix C, p. 161. The distribution of superior cotton seeds in India was commenced by the East India Company as early as 1788. In 1813 the services of Americans were obtained to improve its cultivation. Again in 1818 and 1831 in the Maratha country and Gujrat experimental farms were established. But in the early nineteenth century these efforts remained limited to south India. The main varieties of foreign cotton which suited well to the soil and climate of India were Bourbon, Egyptian and New Orleans: *loc. cit.*, also, *First Report of Indian Territories From the Select Committee of the House of Lords Session 1852-53*, question nos. 1865-66, p. 179.

[45]*Report on the Land Revenue Settlement of Kangra District 1865-72*, para 15, p. viii.

[46]Latif, Syad Muhammad, *Lahore: Its History, Architectural Remains and Antiquities*, New Imperial Press, Lahore 1892, p. 257.

[47]See *Report on the Administration of the Punjab 1851-52 and 1852-53*, para 470, p. 192 and *Gujranwala District Gazetteer 1883-84*, p. 53.

[48]See for instance *Amritsar District Gazetteer 1892-93*, pp. 94-95, *Shahpur District Gazetteer 1897*, p. 171: and *Attock District Gazetteer 1907*, pp. 158-59.

[49]*Imperial Gazetteer of India Provincial Series, Punjab*, Vol. I, pp. 61-62.

[50]Ibid, p. 62.

[51]See for instance *Bannu District Gazetteer 1907*, p. 81.

[52]See Syad Muhammad Latif, *Lahore: Its History, Architectural Remains and Antiquities*, pp. 257-58; and *Bannu District Gazetteer 1907*, p. 84.

[53]See *Amritsar District Gazetteer 1892-93*, p. 94; and *Karnal District Gazetteer 1883-84*, p. 162.

[54]Banerjee, Himadri, *Agrarian Society of the Punjab 1849-1901*, pp. 91-93.

[55]See *Imperial Gazetteer of India Provincial Series, Punjab*, Vol. I, p. 59. Its wider popularity is evident from the case of Kernal district. In this district only four Behia Mills were sold in 1881 but in 1883 the figure rose to 395. See *Karnal District Gazetteer 1883-84*, p. 163. Similar was

the case of many other districts. See for instance *Report on the Administration of the Punjab and Its Dependencies for 1897-98*, para 464, p. 159.

[56]*Gurdaspur District Gazetteer 1883-84*, p. 62. Another landmark in this field was the establishment of Sujanpur Sugar Works in May, 1877 which commenced working in November, 1878: *Ibid*, pp. 56-57.

[57]Kerr, Ian J., *The Agri-Horticultural Society of the Punjab 1851-71*, p. 262.

[58]The labour of Persian wheel was much easier as expressed in the saying "Harat ek ankh se chalta". One eye was enough for a *harat*, for the driver (*gaderia*) who sat on the beam to which the yoke was tied may be blind and the *paniara* (who directed the water to the field) only needs one eye. See *Karnal District Gazetteer 1918*, pp. 107-09.

[59]*Amritsar District Gazetteer 1883-84*, p. 44.

[60]*Ferozepore District Gazetteer 1915*, p. 160.

[61]Banerjee, Himadri, *Agrarian Society of the Punjab 1849-1901*, pp. 98-99.

[62]*Bannu District Gazetteer 1907*, p. 76.

[63]*Report on the Administration of the Punjab and Its Dependencies for 1897-98*, para 464, p. 159.

[64]See *Ferozepore District Gazetteer 1883-84*, p. 67; and *Bannu District Gazetteer 1907*, p. 79.

[65]A good description of various crops grown on lands irrigated from canals, wells and dependable on rainfall separately is given in *Gujranwala District Gazetteer 1935*, pp. 142-52.

[66]*Bannu District Gazetteer 1907*, p. 77.

[67]See *Imperial Gazetteer of India Provincial Series Punjab*, Vol. I, pp. 58-59; J. M. Douie. *Punjab Settlement Manual: Civil & Military Gazetteer Press*, Lahore 1909, para 261, p. 126.

[68]See *Jhelam District Gazetteer 1883-84*, p. 96; *Karnal District Gazetteer 1883-84*, pp. 161-62; and *Gurdaspur District Gazetteer 1883-84*, p. 50. Increase in the value of manure increased its price. For instance in Bannu district manure at the outset of the twentieth century was sold in the villages at from rupees 7 to 10 per hundred donkey loads equivalent to roughly 150 maunds per rupee. See *Bannu District Gazetteer 1907*, p. 77.

[69]*Sialkot District Gazetteer 1920*, pp. 79-80.

[70]*Report on the Administration of the Punjab 1851-52 and 1852-53*, para 465, p. 188.

[71]*Gurdaspur District Gazetteer 1883-84*, p. 52.

[72]*Ferozepore District Gazetteer 1915*, p. 177.

[73]See *Report on the Census of India 1931*, Vol. XVII, Part I, pp. 35-37; and M. L. Darling. *The Punjab Peasant in Prosperity and Debt*, Manohar Publications, Delhi, 1977 (reprint), p. 149.

[74]*Report on the Administration of the Punjab and Its Dependencies for 1897-98*, para 478, p. 166.

[75]*Ibid*, para 476, p. 165; and *Report on the Administration of the Punjab and Its Dependencies for 1877-78*, para 266, p. 104.

[76]See *Report on the Administration of the Punjab and Its Dependencies for 1877-78*, paras 255, 257, pp. 101-02; and *Report on the Census of India 1921*, Vol. XV, part I, para 7, p. 10. This development is also noted in the *Punjab District Gazetteers*.

APPENDIX

*A Brief Descriptive Note on Changes in the Paper-making Technology in Europe**

In the 16th century the European paper mills were actuated by water-power. This was in contrast to the Oriental methods of beating the paper materials with the use of man-power. The European mould-covers were also different for their Indian counterparts. Whereas the Indian mould-covers were made of dried grass laid side by side

*Source: Dard Hunter, *Papermaking: The History and Technique of an Ancient Craft* (London, 1957); S. P. Ahuja, *Paper Industry in India Report and Directory* (New Delhi, 1976); R. W. Sindall, *The Manufacture of Paper* (London, 1919).

and laced together at intervals with horse hair, the European artisans substituted the bamboo and horse hair by metal wires. In the 16th century metal wires were made in Europe by beating the material into their plates, and then cutting them into strips and sounding them with a hammer. Though the metal wires did not make any functional or technical advance over the grass nets of India, the use of metal was an act of innovation. In the 17th century the European stampers were shod with rough iron teeth.

In 1680 the Dutch devised a method of macerating rags that would save labour. This was a cylinder beater for reducing rags to fibres suitable for the making of paper. This machine is known to this day as the "Hollander" after the country of its invention. It consisted of an oblong wooden tub, rounded at both ends, in which revolved a solid wooden roll made from the trunk of a tree and fitted with about thirty iron knives. The linen and cotton rags circulated around the tub and were lacerated by the action of the metal bars of the roll revolving over a metal or stone bed-plate set in the bottom of the tub directly under the roll. The material was kept in constant motion by the impetus given by a back-fall and by the rotation of the roll, through the water-power.

In spite of some advances in paper manufacturing technique, paper was formed by hand until the beginning of the 19th century. A skillful worker dipped a flat sieve-like mould of a given size into a vat filled with macerated fibres suspended in water, and brought forth upon the porous surface of the mould a thin layer of matter fibres—a sheet of paper. But the invention of a paper machine by a Frenchman, Nicholas-Louis Robert in 1798 changed the situation. The small, undeveloped machine was set up in the Essonnes paper mill and the French government granted Robert a fifteen-year patent and advanced money for the perfection of the machine. Aside from the models made by Robert little was accomplished in France and it was only in the first decade of the 19th century that Robert's invention was put to practical use by John Gamble and Bryan Donkin, the ingenious mechanics of England. The mechanics were working for Henry and Sealy Fourdrinier, the London stationers. But like Nicholas-Louis Robert, the Fourdriniers did not reap any financial advantage. It was Bryan Donkin who converted these mechanical inventions into the practical commercial use in 1812. The paper machines began to be manufactured in England, Donkin making huge profits. In 1851, the year of the Great Exhibition, London, the firm of Bryan Donkin made their 191st machine for fabricating paper in endless reel.

The early paper machines were incomplete in their conception, there being no suction under the wire; the paper was wound up while still moist, cut into sheets, and hung in the drying loft as had been the practice with hand made paper. The first drying cylinders in connection with the paper machines were invented and patented by an Englishman, Thomas Crompton in 1820. Soon they came in the general use. The drying rolls accomplished the drying of the paper in a few minutes. This was in strong contrast to the old method of hanging papers which took a few days to dry. The drying

cylinders were originally heated by wood or charcoal fires placed within the metal rolls, but in later years steam was introduced. Thomas Crompton, the English inventor, also conceived the first cutting device to be placed on a paper machine. The improved device by Robert Ranson come into use in 1839.

A machine for pasting sheets of papers forming cardboard, had already been invented in 1824. In that year a patent had been granted to John Dickinson, the inventor of the cylinder machine.

Though the mechanical devices were increasingly invented and used in Europe, the Europeans still used linen and cotton rags or a mixture of these fibres. Around 1800 Matthias Kopps, living in London, began his experiments in the use of wood, straw, and the deinking of paper. Three books were compiled by Kopps, using these materials for the paper upon which they were printed. Gradually further innovations in manufacturing process took place which reduced the dependence of paper industry on cotton and linen rags. These developments followed two distinct path ways. In one, fibres and fibre pigments were separated from wood structure by mechanical means. In the other wood was so treated through chemical solutions that it dissolved and removed lignin and other wood components leaving cellulose fibres behind. In Germany in 1840, the ground wood pulp was first manufactured but the process took some time to come into extensive use. Soda pulp was first manufactured in England in 1852.

Apart from use of wood pulp in Europe in the mid-nineteenth century, other developments in paper manufacturing included vat sizing and chloric bleaching. To make paper resistant to moisture absorption and good for writing with water based inks, new methods of sizing papers in vats with resin and alum became vogue in Europe in the 1840's. To compete with the fine English paper sized in the machine with animal glue, the French paper manufacturers adopted a new method in 1857. Experiments in the sulphite process for the preparation of wood fibre for paper-making began in Paris.