

A Study of Two Distinct Periods of Ephrata Cloister History

BY JACK WARD WILLSON LOOSE

I. Mills of the Cloister

The Ephrata Cloisters owed its founding, if not its *raison d'être* to Johann Conrad Beissel, who was born in April, 1690, at Eberbach in the German Palatinate. Beissel's father was an intemperate baker. His mother, a simple, devout woman, was left a widow two months before Johann Conrad's birth. She, too, died eight years later, leaving her children insecure and poverty-stricken. Johann Conrad became what we would call a street urchin until he was apprenticed to a master baker. After his apprenticeship started, and until his twenty-fifth year, Beissel experienced all the fleeting pleasures of reckless youth, becoming somewhat of a violinist during the process. His chroniclers have confided that Beissel was in his glory at any festivity of young men and maidens.

Then something happened. Beissel became thoughtful and serious. Why was he alive? What purpose had he other than fiddling and dancing and playing? Apparently his first plan was to associate himself with his fellow bakers who were going to battle the Turks, east of Germany. However, Beissel arrived at the recruiting office too late, thereby cancelling his plans. Shortly afterward, the entire battalion of bakers was annihilated, which Beissel interpreted as a divine signal to him. Accordingly, he began the study of theology, picking up bits of Pietism here and fragments of Anabaptism there. Included among his studies were theological discourses by the eminent Lutheran clergymen Ludwig Mieg and Johann Christian Kirchmeir.¹ It is known that at this time young Beissel was introduced to the Rosicrucians with whom he joined with intense seriousness of purpose. It will be seen later that his intercourse with the recognized as well as banned theological and mystical groups was influential in the activity of the Cloisters.

When his mystical activities became known to the bakers' guild, Beissel was cast out, condemned socially and economically. So in 1720 young Beissel sailed to the New World with fond hopes of entering the Community of the

¹ "German Sectarrians of Pennsylvania," J. F. Sachse, vol. 1, p. 39.

Woman in the Wilderness founded by Johann Kelpius at Germantown. To the young mystic's dismay the community had been abandoned by most of its followers, some to take up worldly abode in Germantown, others to seek further into the wilderness. The only practical thing for Beissel to do was to continue his dual task of earning a living and studying theosophy. Since Germantown already had its share of bakers, Beissel learned to weave.

It was hardly coincidence that Beissel chose to indenture himself to Peter Becker, master weaver, and fellow religious thinker. Becker came to Germantown from Crefeld one year before Beissel landed in America. This was the same Peter Becker who established the German Baptist Brethren or Dunkard Brethren.

It is not difficult to imagine master and apprentice, seated at their looms, their fingers working the fibres into a fabric while their minds busily pondered the uniting of the German-speaking settlers into congregations of local inspiration. It must be remembered the Lutheran and Reformed churches had not as yet furnished an adequate supply of clergymen for the settlements in the hinterland. Many of the German farmers were content to put religion out of their minds, or perhaps take up the religious doctrines of the English inhabitants. These thoughts disturbed Beissel until he set forth, in 1721, to bring a dynamic, inspirational form of worship to the Germans in the country.

Beissel and a companion established themselves in a cabin along Mill Creek, about eight miles above its junction with the Conestoga, near Bird-in-Hand, Lancaster County.

For some time Beissel acted in the self-appointed capacity as spiritual leader of the numerous German sectarians, including the Mennonites of the Pequea valley. At one time Beissel visited the Labadists in Maryland from which he doubtless received many ideas in the establishment and maintenance of a religious community. By 1723 Beissel was acknowledged a man of great potentialities in leading the German religionists. His reputation reached to the ears of his former master in Germantown, Peter Becker. News of this sort was hardly welcome to the German Baptist Becker, whose intentions were to bring the Conestoga and Pequea valley settlers into the Baptist fold. That Beissel forced Becker into immediate activity is evidenced by the preparations made by the Germantown Baptists to cover the southeastern area of the province with bands of missionaries. The English Sabbatarians of northern Chester County developed close relations with Beissel's followers, thus re-enforcing Beissel's theory of keeping the seventh day holy.

A stroke of strategy employed by Becker cemented the various German sects by having Beissel declared the leader of the Conestoga congregation of the German Baptists or Dunkers. This tactic soon proved unsatisfactory, for Beissel convinced the majority of his followers that Saturday was the Sabbath Day. The other German Baptists observed the Sabbath on Sunday. Beissel's power was growing with a vigor Becker was unable to match. Soon converts were setting up cabins along Mill Creek in order to be with the young preacher. In 1725 the widow and the four sons of Michael Eckerling,

an outstanding Pietist of Strasburg, Germany, came to the Mill Creek community. The following year several unmarried women took up residence close by Beissel's cabin. Technically, this was the first step in establishing the Cloisters.

Matters had become pressing by 1727; a definite understanding between Beissel and Becker was in order. Peter Becker called a conference of the German Baptist Brethren at Martin Urner's farm at Coventry in Chester County, but the hand of fate rested heavily upon Becker, for sickness prevented his attendance. Among the issues to have been discussed was that of the unorthodox practices observed by the Conestoga congregation. Ironically, Beissel was selected to preside over the conference. This conference, according to J. F. Sachse, constituted the first inter-congregational assembly of the Brethren Church. The *Chronicon Ephratense* offers this description: "On this occasion quite extraordinary powers of eternity manifested themselves, such as were never known before or after, so that it was called the congregation's Pentecost." It might well have been termed the "fork in the road," because those members present realized Beissel had surpassed Becker in brilliance and personality. Before long the congregations split internally into the two camps: Becker with his Dunkers, and Beissel with his Sabbatarians. Beissel was confident, his preaching advanced to a place where involved, mystical explanations poured forth without reference to book or paper. Antiphonal singing was introduced to the followers who later were to bring this musical art to a remarkable degree of perfection. The severance became complete in 1728 with the return of baptism. This odd occurrence took place because Beissel felt re-baptism for members of the off-shoot congregation would be wrong unless their previous baptism was returned to the Becker faction. So seven members first renounced the earlier immersion, and were then immersed thrice backwards, and then thrice forwards. Thus the Baptist ceremony was satisfactorily undone, and the Sabbatarian baptism accomplished!

Friction between the congregations continued, and strong feelings occurring between the leaders and their individual followers created a constant parade of disgruntled sectarians deserting one faction and joining the other.

Alexander Mack, the venerable patriarch of the continental Baptists, arrived in America in 1729. His coming to Pennsylvania was expected to unite the rivals. The first meeting of Beissel and Mack concluded all such hopes. Beissel was approached by the condescending, solicitous Mack who cried, "The peace of God the Lord be with you!" as he embraced the cold, aloof Beissel. The laconic reply was, "We have that peace." Both leaders fell to quarreling violently and exchanging bitter words.

Beissel included among his closest aides Michael Wohlfarth (Welfare) and Jan Meyle (John Miley). Under the unrelenting efforts of the Beissel group, many new converts were obtained, several of them married women who had deserted their husbands for the magnetic Beissel. In addition to this community of devotees, Beissel ministered to the surrounding settlers in the neighboring areas. Scandal broke out in the country-side in view of

Beissel's activities with the single as well as married women. Soon the provincial officers expressed alarm over the peculiar relationships thus created. The law also questioned the right of the followers to occupy land which belonged to the London Company. The third infraction which disturbed the authorities to no end was the observance of Sunday as the first day of the week, and therefore, a day of work. Provincial law did not permit the settlers to work on Sunday. Consequently, the community requested Beissel to lead them into the "wilderness" away from the watchful eyes of the law and their tongue-wagging neighbors. Beissel demurred, inasmuch as he regarded his "outside" congregation with considerable favor. This attitude caused jealousy between the regular congregation and those who had dedicated their lives to the solitary way of religious life. In February of 1732 Beissel saw the necessity of retreating to the wilderness with his flock.

Turning his back to the secular congregation, Beissel regretfully pressed deeper into the forest until he arrived eight miles northward at the cabin of Emanuel Eckerling on the Cocalico Creek. This tributary of the Conestoga derived its name from the Indian description of the meadow in which Eckerling built his cabin: Koch-Kalelung, or Den of the Serpents. Contrary to popular usage, the name Cocalico should be pronounced COH'-ca-LEEK'-o by virtue of its derivation.

Beissel soon erected a cabin in the same meadow and began the life of a hermit, providing meager needs for himself, and devoting most of his time to writing mystical discourses and hymns. Before too long his followers came to the banks of the Cocalico where they, too, built a cabin. The fourth structure, and actually the first building of the Cloisters was constructed for several unmarried women in 1732. This small convent was placed at a discreet distance on the opposite side of the Cocalico. By 1733 the German Sabbatarians held all the land within a four radius of the Cloisters.

The congregation was separated into four areas named Massa, Zoar, Hebron, and Kadesh. Reamstown now exists on the site of Zoar. The Cloisters comprised the Kadesh area, and Hebron apparently was located at what is now called Akron, in view of its topographical resemblance to the ancient city in Judah. Massa possibly was located between Ephrata and Denver. Beissel's followers composed two bodies: the single brothers and sisters living in celibacy, and the householders living close by, but maintaining a more independent relationship with Beissel. With Beissel were his young friends, the Eckerling brothers—Israel, Samuel, Emanuel, and Gabriel—and his devoted assistant, Michael Wohlfarth (Welfare).

From this time until seven years later Beissel's spiritual community was to enjoy a fervor which shall be called its "era of religious prosperity".

Era of Religious Prosperity

This study concerns the comparisons and contrasts of Ephrata's two periods of prosperity, each approximately seven years in length. The first era began about 1732 with the founding of the Cloisters, and it is this period which will now be analyzed.

The organization of the community had been more or less unplanned since the chief concern of each settler was to follow the footsteps of Beissel. Physical requirements of the followers were attended to only after full devotion had been given the master's wishes. The very nature of Beissel's mystics created an informal division of membership: those who deprived themselves of earthly responsibilities and pleasure to live in solitude; and those whose families made necessary a degree of conformity to the usual farm life. The first group consisted of single men and women which afforded the neighborhood scandal-mongers much tongue-wagging activity. To put down the ugly rumors, Beissel established a religious group for the maiden sisters, and it was called the Order of Spiritual Virgins. This arrangement also tended to bind the members into closer unity of purpose. The domestic group received instruction from Beissel insofar as the management of their households was not involved. This group became known as "householders," and served to maintain some degree of stability in the community. Unorganized and unhampered were the single brethren who formed an influential faction within the organization. During the period of great religious activity these single brothers observed a division of feeling in their midst; some favoured Beissel, others were drawn to the theosophical speculations of the Eckerling brothers. In time this difference of loyalty was to become a major factor in the re-organization of the community.

The first phase of Ephrata's prosperity depended primarily on the personalities who gave the Cloisters the purpose for existence. Johann Conrad Beissel, of course, was the leader. His education was crude for carrying out the duties he undertook; his grammar was far from acceptable, and his logic rarely co-existed with his preaching. But the mystic had the wonderful power of attracting people and overwhelming their religious passions. The magnetism of this man is apparent upon considering the ease with which Johann Peter Miller and Conrad Weiser were converted. Beissel had tremendous power and just as much self-confidence. Every activity was in complete accord with God's instructions, and the *Chronicon* gently hints that Beissel conferred with God frequently with the result that each command had not only the Lord's blessing, but Beissel's as well. Beissel's early life evidently was marked by insecurity and indecision. His behaviour appeared quite odd, but hardly any more so than later evangelists whose sanity was never questioned. Modern psychologists would probably pronounce Beissel relatively sane, but with neurotic symptoms.

In direct contrast to Beissel was Johann Peter Miller, the German Reformed theologian and classical scholar. Not only was Miller tall and erect, but his manner was graceful and easy-going. Beissel, on the other hand, was short and stout, and spasmodic in motion. Miller was a brilliant scholar at the University of Heidelberg from which he was graduated at the age of fifteen. During the following five years he studied advanced theology, including the eastern religions and the early Christian sects. His command of Latin and English and Greek was excellent; his German was faultless. Science interested Miller to the extent that he was elected a member of

the American Philosophical Society while he served the Cloisters. His personal friends included the Penns, General Washington, Benjamin Franklin, and many prominent men of worldly significance. But this intellectual giant, this eighteenth century Aristotle, became like putty in the hands of the awkward, ex-baker from the gutters of Eberbach. Not only did Miller leave his Reformed congregation at Tulpehocken, he and Conrad Weiser burnt their Heidelberg and Luther's Catechisms in a wierd ceremony which enraged the orthodox German settlers. These two converts came to Ephrata along with numerous Reformed and Lutheran converts who had deserted the recognized churches.

Conrad Weiser, shrewd, brilliant, and capable as magistrate, diplomat, and politician, entered the Cloisters long enough to secure the official recognition of the provincial authorities, after which he left, causing Beissel great embarrassment.

Michael Wohlfarth was perhaps the most unbalanced fanatic at the Cloisters—a fact known to Beissel! Wohlfarth and Miller had the distinction of never opposing their leader. Usually in charge of missionary journeys, Wohlfarth made annual visits to Philadelphia to molest the Friends during their General Meeting. His nuisance value was appreciated by the Quakers, and the Franklin Press which awaited the annual arrival as would a child in gleeful anticipation of the circus.

These were the chief personalities in the Ephrata Cloisters during its hey-day of spiritual activity.

No organization comes into being without a purpose more or less mutually acceptable to its members. Ephrata was settled by religious devotees whose primary purpose was to live the life specified in the Scriptures, with literal interpretations by Beissel. To a people persecuted by religious tyrants and restrained economically by vestiges of feudal land practices, the apparent security offered in the wilderness at Ephrata seemed as close to an earthly "Nahe Himmel" as could be found. Of course, the typical Palatinate native was not inclined to mysticism, even if he understood the meaning of the expression. Followers of mystics frequently loaned their mass to their favourite leader, absorbing little, but vibrating in response. The settlement at Ephrata, similarly, had many followers whose mentalities would have been sorely pressed to understand the meaning of the phenomena of which they were a part. Sufficient mystics were present, however, to assure the simple people their community was purposeful.

Consequently, Beissel was able to overcome the inertia-preventing congregation despite his several attempts to remain an anchorite in Pennsylvania's "Schwarzwald." These people were not impressed by the cold logic and formal liturgy of the Reformed and Lutheran churches; they desired religious expression of the more stimulating, ecstatic type. Beissel understood and appreciated this "Sehnsucht."

Beissel drew heavily from the Apocalypse, and from this highly symbolic and awful Book came the weapons and threats and magic potions employed by him. The Four Horsemen would ride the gentle ridges of the Conestoga

valley, bringing death and slaughter and famine and disease to all the worldly settlers without the Cloister confines, but never would the quartet of destruction cross the meadow along the Cocalico! Curiously enough, Beissel never regarded such a catastrophe with other than the smug satisfaction that his converts would find complete immunity. Beissel preached and exhorted whatever came into his mind, using Saint John's Revelation and augmenting it, when necessary, with divers allegories of his own fabrication. The settlers apparently enjoyed these spectacles, if for no other reason than to see and hear Beissel's violent delivery!

Beissel based his teachings on an involved sequence of events in which the fall of man became known to him. The unique argument is presented in "*A Dissertation on Man's Fall*" by Beissel, and despite the similarity to Jacob Boehm's writings Beissel has introduced some novel explanations of man's fall. Most trinitarians would repudiate Beissel's elaborate thesis on the grounds it was illogical and without Scriptural foundation. Careful analysis shows Beissel to have navigated a careful course throughout his dissertation without moving outside the basic conception of Christianity; indeed, he considered his every act and writing to be imbued with the purest form of Christianity! Reduced to the briefest explanation, Beissel's thesis is herewith given:

During the course of events, Satan becomes unruly and tries to conquer God's Heaven. Prior to this rebellion both God and Satan are presumed to be static, and possess all the attributes of gentle, humble non-sexual Beings. In order to overthrow Heaven, Satan assumes the male form which is symbolic of power and rule. To counter Satan's project, God also assumes the male form, thus preventing Satan from becoming God's husband and master. To further thwart Satan, God divides all life into male and female sexes. The result of this action placed God's forces over those of the Devil.

Beissel then observes God possesses both male and female powers. When the day came to pass that Man should be created, God gave Adam His own dual-sex characteristics which would complete the balance of power in God's favour. Adam soon noticed the mating activities of other animals, and requested his alteration into the male sex. God granted this request and Adam's femality was liberated, after which she sought her proper mate. To permit Adam the conditions of animal activity God took from Adam's body Eve who had the attributes of a female in addition to a small degree of maleness since she had originated from Adam. This maleness possessed by Eve destroyed the perfect master-humble servant harmony, and so she fell with Adam.

Meanwhile, Adam's original femality, now named Sophia, gave birth to the second dual-sex man whose name was Christ. Christ had the physical appearance of a man and the spiritual nature of a female. By his crucifixion Christ lost his male form, and thus the balance was restored, indicating the subordination of maleness.

Beissel then proceeds to explain how "we must become like Christ" and permit our maleness to be destroyed along with his. Thus Christ becomes the mate of the Spiritual Virgins, and Sophia, the spiritual bride of the Brothers.

The concept of good and evil, light and darkness, male and female, power and humility, and strong and weak was basic in all early religious forms, but never was it given such an algebraic substantiation! Orthodox theologians would be hard pressed to provide their teachings with equational solutions!

The Cloister organization was autocratic during Beissel's regime. For want of a more accurate description, the religious form will have to be labeled "Beisselism"; that is to say it was neither Dunker nor Seventh Day Baptist as many persons fail to realize.

Dr. Julius F. Sachse, for many years prior to his death in 1919, was librarian and museum curator of the R. W. Grand Lodge, Free and Accepted Masons of Pennsylvania. In this capacity the learned doctor had at his disposal unlimited references to mystical phenomena, although his chief writings on the German sectarians at Ephrata were published prior to his association with the Masonic Library. Sachse believed Beissel was inspired mainly by Gottfried Arnold, a seventeenth century Lutheran theologian, historian, and mystic. Arnold concerned himself with writings on the disadvantages of matrimony; indeed, his *Betrachtungs-würdige Anmerkungen von der Natur und Beschaffenheit des ehelichen und unverehelichen Lebens* was highly esteemed by Beissel. The Ephrata mystic wrote "*Die Wunderschrift*" which can be compared easily with Arnold's work, and this similarity is Sachse's basis for placing the origin of Beissel's inspiration. Nevertheless, Sachse, as he did so frequently, used circumstantial evidence to form his argument. If Sachse believed Arnold received his inspiration from the famous mystic, Jacob Boehm, he did not indicate this fact in his writings, contrary to the position held by Ernest Stoeffler in his recent research concerning mysticism among the Pennsylvania Germans.

The choice of Dr. Oswald Seidensticker is Jacob Boehm whose teachings were presumed to have reached Beissel through the agency of Johann Gichtel, the most fanatical of the seventeenth century zealots. Polite society always has ignored the mystic Gichtel; his unnatural behavior ornamented to such an extent the teachings of Boehm that Beissel could have devoured the essence with extreme delight. It is thought that Boehm's works would have presented too great difficulty in comprehension to Beissel's untutored mind.

The leader (Vorsteher) of Ephrata apparently did not encourage hysterics as a manifestation of the Spirit, although all such instances were duly regarded as sincere and valid. It may be concluded Beissel acted in the role of high priest, interpreting mystical speculation into practical activities for persons devoted to the pristine Christian religion.

Conrad Beissel never permitted his ideas to carry him away quite so far as many of the continental mystics, and for that redeeming fact we must thank Penn's religious tolerance, for there was little opportunity for great masses to imagine themselves subjects of religious oppression. Beissel, no matter how one views his situation, cannot be called a martyr. Moreover, the rugged, untamed wilderness necessitated practical attention to one's survival.

Beissel truly was crammed full of ideas and various sorts of mysticism. Influencing him to some degree were the following factors:

1. *The Societies of the Common Life developed by the practical mystics Groot and Thomas a Kempis.*
2. *The Rosicrucians of Heidelberg.*
3. *The academic mysticism of Jacob Boehm.*
4. *The erotic and fanatical mysticism of Arnold and Gichtel.*
5. *The German Anabaptists.*
6. *The Labadists.*
7. *The Quietists.*
8. *The intellectual Pietists.*
9. *The English Sabbatarians (whose origin was the group of Lowlands mystics' communal societies).*
10. *The psychological and environmental effect on Beissel.*

Activities of the community not directly relating to the religious services consisted of light trades and routine domestic chores. The sisters cooked and the brethren farmed. Since beasts of burden were not used during this period, several of the brethren were yoked to the plough. The more talented sisters of the Order drew and painted beautiful bits of fractur, examples of calligraphy, and illuminated manuscripts. Beissel also taught the brothers and sisters to sing their peculiar style of music to convey an impression of angelic singing. To accomplish this odd style, Beissel wrote the music in as many as six parts. To explain his system of music, Beissel wrote a treatise on this subject. (Some local musicgraphist would contribute greatly to the restoration of the Cloisters if the music of Ephrata could be recreated for recording.)

Ephrata remained an agricultural economy throughout this seven-year period. The food grown was used either for the refectory tables or for free distribution to the poor.

During this period great increases in membership required the construction of additional buildings. Accordingly, in 1735, Kedar was erected. This building consisted of small cells for the single members on the first and third floors, the second story being used for meeting purposes. One year later, a Saal, or chapel, called Bethaus, was built adjacent to Kedar. This structure contained meeting rooms and a large chapel, two stories in height, with galleries protruding at each end at the second floor level.

Prior to the erection of Bethaus, Kedar housed both sexes; after the house of prayer was completed, Kedar was occupied exclusively by the Order of Spiritual Virgins, the brethren having been moved to smaller cabins. Bethaus was then used for general meetings of the members. The householders used the main floor while the single members sat in the galleries screened from public view.

The financial structure of the Ephrata Cloisters did not share in the spiritual prosperity during the first period. Each member who came into the Society was obligated to contribute heavily to the Cloister fund which was administered by Beissel. Most single members had never acquired any

worldly riches, and therefore, they had little to lose. The householders were reluctant to continue their contributions in view of Beissel's mismanagement of the common funds. The *Chronicon* admits much of the money held by the leader disappeared without proper accounting for the disbursements. It was known Beissel gave freely to all beggars. The economy of early Ephrata was simple socialism of a type not unknown in America at present. Inasmuch as the monastic part of the community depended mainly upon the charity of the land-owning householders, plus the confiscation of wealth previously owned by the brethren, the Cloisters could not be classified as a pure communistic society. The irresponsible expenditure of common funds, the offering of unmerited charity, and the resistance of the hard-pressed householders drove the Society into a semi-pauper state of affairs. How could the Cloisters keep the wolf from its spiritual door? Four brothers named Eckerling had the partial answer to this riddle.

The Era of Economic Prosperity

Israel, Samuel, Emanuel, and Gabriel Eckerling were shrewd young men. Israel was possessed of remarkable executive ability and leadership. As a trader Samuel drove a hard bargain, while brother Emanuel took the role of super-salesman! Gabriel played straight man for his brothers' adventures in the unethical. Nevertheless, even this unglamorous part was carried out with utmost perfection by the crafty Gabriel. Within his spiritual Utopia was the last place Beissel would expect to find the handwork of the Apocalyptic quartet—much less the four evils in persons!

Control of the community would give the brothers virtual command of all manpower and resources. Yet this was to be accomplished without removing Beissel as the nominal and apparent head of the community, for his devotees would never go under the yoke of others without the approval of their leader. Thus Beissel was to aid in his own fall, for he became by device an instrumentality of the Eckerlings.

Only by organization of the brethren into a solitary order similar to the sisters' order could effective control be secured. Up to this time the brethren were divided in their loyalties; some favoured Beissel while the remainder threw their support to the Eckerlings. It was realized this split would be brought together by the organization of a brotherhood with the blessing of Beissel. To the Rosicrucian Beissel followers the number "forty" meant perfection. So deftly did Israel Eckerling convince Beissel that his single male followers completed the perfect number, that establishment of the brotherhood proceeded without delay. Even those who hesitated were aware of the poor housing conditions endured by the brethren in their make-shift cabins. Beissel gave his approval to the building of a monastery for which funds were contributed by a wealthy young Swiss. Although the Eckerlings planned to locate the structure on an advantageous site, Beissel reserved the privilege of selecting a spot on what is now called Zion Hill. Furthermore, Beissel and his close associate, Peter Miller, retained the power to appoint the prior who would supervise the brotherhood. Since Gabriel Eckerling held the respect of all the brethren, and he took such a healthy

interest in the founding of the brotherhood, he was appointed first prior to the Zionitic Brotherhood. Immediately he took the name, Brother Jotham. The auspicious beginning of the brotherhood prompted Beissel to publish his latest hymn-book, "*Weyrauch's Hugel*" (Zionitic Mountain of Myrrh). Despite the good feeling, quarrels arose among the members, and Brother Jotham was replaced. To the strong leader, Israel Eckerling, went the office of prior, who called himself Prior Onesimus, which means "useful" in Greek.

At this time the stream of new members continued, and included such people as Alexander Mack, Jr., Jonathan Hocker, Ludwig Blum, and Christian Eckstein.

As head of the powerful Zionitic Brotherhood Israel Eckerling controlled the manpower completely. There were still three more things to be brought under the power of the Eckerlings—land, finance, and a continuing appeal for converts in the world outside.

In 1739, a strange transaction took place which ranks high among the records of "double-double crossing." The ownership of the community land had never been given much consideration, and apparently Israel assumed one of the householders possessed the tract. One of Eckerling's faction, Jan Meyle (John Miley), and his wife, Barbara, assured the prior this was true, and that, indeed, they (Meyles) were the owners, and that they would be willing to sell the tract to the Eckerlings for £27 18s. Accordingly, a "deed" was conveyed to Israel, Samuel, and Emanuel Eckerling, and Jacob Gasz for the tract. Israel was ignorant of the fact that the Meyles never owned the land!

Actually, the Penns had warranted 125 acres to one Ulrich Carpenter in 1733, and the 114 $\frac{1}{4}$ acres to George Masters in 1737, but neither man would claim or pay for his tract in view of the settlement already established upon it. Several years later, Israel discovered he was holding false title to the Cloister tract, and in 1741, he petitioned Governor John Penn for a grant of the 239 $\frac{1}{4}$ acres in consideration for the amount agreed upon by Carpenter and Masters. This legal transaction gave Israel sole title to the land which he later secretly gave in part to his brothers, excluding Jacob Gasz, one of the original purchasers. This transaction was kept secret for twenty-three years after which time the deed was recorded.

Because the brotherhood monastery, named Zion, provided living quarters only, the brethren still worshiped in the Kedar-Saal under the direction of Beissel. This arrangement was not favoured by the Eckerlings inasmuch as Beissel, in this manner, retained some control over the brethren. In 1740, a large chapel was built adjacent to Zion for the use of the Zionitic Brotherhood. This action completed the division between the Beissel followers and the Eckerling faction. The differences were manifold.

Religious Differences

Theosophical differences permeated the fibre of the Cloisters. Scholars have presumed the spiritual breach between the Eckerlings and Beissel to have originated as a result of their varied avenues of study.

After touching upon the superficialities of Beissel's method of worship one might well ponder the underlying basis of Beisselism, and question its

immunity to the theosophy of other mystical groups. Traditionally historians have considered the Ephrata community a mystical phenomena involving countless peculiarities derived piecemeal from ancient mystics, Pietists, Hebrews, disgruntled Roman Catholics and untamed Reformed-Lutheran souls.

To better understand the division of religious thought at Ephrata one must go back to the ancient mysteries and the mystics. Beissel was a mystic; the Eckerlings practiced the traditions of the mysteries.

Mysticism came to Western Civilization from the Orient, chiefly India, by way of Persia. Although mysticism preceded Christianity, it was unable to significantly influence the West until the decline of the Greek and Jewish civilizations. Thus mysticism and Christianity appear to move contemporaneously. The hinterlands of Europe, and particularly Germany, saw great mystical activity at the beginning of the twelfth century due in part to protest against the dialectical teachings of Abelard, and traceable also to the gloomy forests and hills of central Europe. The psychological effects of long, dark winters and deep forests operating on the Teutonic and Slavic mind cannot be depreciated. Foremost among the early German mystics was Meister Eckhart whose teachings employ knowledge to achieve the desired objective.

Mystics may be classified as either speculative or practical as well as either intellectual or emotional. The main objective of the mystical mind is salvation; the avenues chosen for attainment may be orderly and well-formulated, or they may be rapturous, sensual, and intoxicated with emotion. Meister Eckhart was both speculative and concerned intelligently.

Early in the fourteenth century, John Ruysbroeck and John Tauler developed mysticism into a warm, personal feeling which co-existed with the established church, not contradicting the church doctrines, but providing an aura of humanism around the core of church discipline. Both the Dutch Ruysbroeck and the Strasburg Dominican Tauler were learned, practical theologians.

The mysticism of Ruysbroeck appealed immensely to Gerhard Groot and Thomas a Kempis, both Rhenish mystics of the fourteenth century. Groot established a number of communities throughout Germany in which the men and women lived much in the manner of the Ephrata Cloisters. Discipline was voluntary; monastic vows were not required. The communal life was identical to that of Ephrata, and Herzog states, "they practiced a considerable variety of handicrafts, and . . . it was agreed their daily bread should be earned, not begged." The sisters supported themselves by spinning, weaving, and needlework. Thomas a Kempis, a student of Groot, compiled the *"Imitatio Christi"* which is frequently regarded as second only to the Bible in purest Christian expression. Kempis also wrote many manuscripts on cloister life and discipline, a few of which are *"The Solitary Life," "The Valley of Lilies,"* and *"The Monk's Alphabet."*

Perhaps the characteristic of these early brotherhoods and sisterhoods most significant to us was their quiet, practical mode of living, as compared to Beissel's intoxicated eroticism.

The passive, practical mystics had their rivals. Even in the Orient the growth of Bhakti and emotionalism came about as a justification for numerous excesses. In medieval Germany the wild mystics led by Thomas Munzer, and the prophets of Zwickau characterized the behaviour of religious zealots whom we later term Anabaptists. This group of mystics demanded actual physical experience and hysterical actions to achieve salvation. Beissel's contact with the Anabaptists prepared him well for his adventure at Ephrata. John Peter Miller, it is seen, derived his mysticism from the learned Ruysbroeck-Groot-a Kempis school.

The mysteries of earlier civilizations provided the Eckerling brothers with their fantastic and well-organized rituals. Whereas Beissel's influence encompassed a "Society," his rivals controlled a "Fraternity" which actually was a hierarchy geared for exploitation.

Mysteries, like mysticism, came westward from India, according to most scholars. At least the structure of the mysteries is derived historically from the Gymnosophists of India, although such an organization appears feasible, if not necessary, wherever mankind existed, despite cultural migrations. The Oriental mysteries imparted their traditions to the Egyptians who, in turn, developed rites and practices to a remarkable degree. Elaborate initiations were required for all candidates. Egyptian mysteries were divided into two kinds, those of Osiris and Serapis (the greater) and that of Isis (the lesser). Osiris was observed at the autumnal equinox; Serapis, at the summer solstice; and Isis, at the vernal or spring equinox. Successful passage through the initiations of Isis was known as the first degree of Egyptian rites. Serapis and Osiris were the second and third degrees, respectively. In each initiation great physical and mental prowess as well as pure character was absolutely necessary. Naturally, only a limited number of the Egyptian notables was eligible or successful. The mysteries did communicate certain doctrines to the masses, but the secrets of the caste were preserved for only the elite. According to Sachse, the Eckerling brothers practiced a form of early Egyptian freemasonry which bears some resemblance but no organic relationship to modern freemasonry.

The mysteries of Egypt passed into Greece (Eleusinian), into Persia, known as Mithras, and into the northlands where Druids and other Gothic and Celtic tribes celebrated the esoteric rites.

Unlike the mystics, confreres of the mysteries devoted their time and talents to celebrating the death and resurrection of some superior being, and gaining knowledge through the media of astronomy, science, chemistry, law, and the other avenues of advanced study. Salvation was of little importance to them since they believed their acceptance into the practice of the mysteries signified superior position eternally. Practicers of the mysteries were inclined toward symbolism, initiations, and probing the natural laws, and elements of the Universe.

Regeneration of the physical body and spirit was the theme of the Eckerling fraternity. The fantastic and romantic mechanics of the ritual were observed with adventure within the fraternity, and with curious awe

without the group; the neighboring non-sectarians viewed the ceremonies "deep within the forest" with consternation and alarm. Peculiar accounts of the Eckerling initiations hint of near-suicidal tests which the novices somehow side-stepped. Israel Eckerling entertained an unusual passion for lengthy, involved addresses which tormented his listeners endlessly, and which doubtlessly transcended their mentality.

The hierarchy of the Brotherhood of Zion was so well organized it has been written no brother could walk a few yards without having a superior official at his elbow. Naturally, such careful management was a favourable factor in operating the various industries of the community.

Eckerling characteristics may be attributed to the following sources:

- a. Love of the dramatic, and of pompous ceremonies.
- b. Attraction to the mysteries of the ancients.
- c. Lust for power.

The Eckerlings appreciated the weaknesses of human nature even more than Beissel, and they exploited human frailties to the limit. The four brothers obviously possessed greater intelligence than Beissel, and they had fully anticipated to deceive everyone with their clever scheme. One person whom they underestimated was John Peter Miller whose remarkable brilliance was unsurpassed in his time.

Thus the relative positions of the mystics and the fraternity of the Eckerlings are defined.

The need for increasing the common treasury was immediate, and the Eckerlings had an idea which would raise the spiritual perfection of the married members. The plan was for the congregation to erect a convent which would be divided in half—one side for men, the other side for women. Divorce proceedings would then be instituted voluntarily by the married settlers, and they would move into their respective portion of the convent. Land and property owned by the families was to be turned over to the Brotherhood. Accordingly, Hebron, or as it is known today—Saron, was built for the spiritual divorcees. In this endeavor, the Eckerlings were faced with the natural yearnings of the ex-married brothers and sisters. Before long the plan was proclaimed a dismal failure, and the families re-united. All was not lost, however, because only a few of the members demanded the restoration of their former possessions, and these were paid off with the usual Eckerling disdain for scruples. A tract of one hundred acres pacified the chief complainant, while use of the adjoining chapel, Peniel (Saal), was given to the congregation. The convent was taken by the Brotherhood in return for their generous restoral of property.

The financial gain from the Cloister industries soon filled the coffers to overflowing. This phase will be treated later.

Knowing how to outbid Beissel for the inspirational control of the community was a task assigned to the wily Emanuel. Beissel had not thought of baptism for the dead although he had sanctioned baptism for nearly every other circumstance conceivable. Taking advantage of Beissel's neglect

for the dead, Emanuel Eckerling had soon convinced a goodly number of the members that their deceased parents and relatives had never received proper baptism. With appropriate showmanship, the Eckerlings instituted this weird innovation which placed them on a spiritual level with Beissel.

With the Sisterhood's prioress conspiring with the Eckerlings, Beissel was obliged to act out the role of "figurehead" as directed or suffer the humiliation of having the community know his actual status. He had dignity and pomp heaped upon his unwilling shoulder by the Eckerlings until he was elevated out of reach and the confidence of his fellow-mystics. To remind Beissel of his required obedience, the Eckerlings forced him to seek new quarters many times in a period of several months.

During this seven-year era of material prosperity, the community became the mightiest industrial center in the New World, and despite its later collapse, it retained such prominence until the rise of the Moravian community at Salem² twenty-five years later. The ability of the Eckerlings for organization was limitless; their commercial acumen was staggering to behold! Judged even by present-day business standards, they were geniuses; their astuteness did not include ethics, unfortunately. With all mills operating to peak capacity and with new projects being planned, and with trade increasing to the extent that ocean commerce and continental agents were being considered, the community was anything but a tranquil haven of ascetic devotion. The hard-working brothers of the community were diligent, but not pleased to be the slaves of the overbearing Eckerlings. Morals were undergoing attrition. Above all other things, the Vorsteher was becoming convinced a showdown was necessary.

As the shadows grew longer in the summer of 1745 the feel of a purge filled the air along the Cocalico. The Eckerlings were uneasy. Israel appropriated £40 with which he persuaded the Sisterhood prioress to bring the Spiritual Virgins' influence to act upon Beissel. To conceal her own corruption, the Mother Superior pitted Beissel against Israel Eckerling.

One day as Beissel was eavesdropping outside the door of the printery, he heard Johann Peter Miller ask Israel why the latter had "cashiered the superintendent." The rough answer, "That is none of your business; you attend to your work," assured Beissel of a faithful ally in the coming fray. Conferences between the two formed the nucleus of the purge.

Gabriel Eckerling was worked into Beissel's confidence by being represented as "opposed to his brothers' scheme," and although Gabriel performed this role successfully, he was unable to gain control of the community for his brothers before he too was expelled.

The expulsion of Israel Eckerling came swiftly following organization of the Beissel disciples. Israel was demoted to menial labor in the fulling

² The Moravians, in 1753, established Bethabara as a balanced economic unit, and later another community, Bethania. Salem, North Carolina, was begun in 1766 by the Moravians, and the people of Bethabara and Bethania were moved to Salem, where over fifty trades and industries were established by 1776.

mill. The penalty was humiliating and the former leader elected to leave Ephrata, soon to be followed by his brothers and a few loyal friends. Later the Eckerlings tried to effect a return to power but they soon discovered Beissel had lost some of his naiveté. The affair had made Beissel a more practical man—one who wasn't too likely to "be taken in" again.

If any doubts were held regarding the objectives of the Eckerlings, they were lost when a large bell ordered by Israel arrived at Ephrata. From amidst the wrecking of buildings and the uprooting of Eckerlings' orchards, Peter Miller was summoned to read the Latin inscription cast upon the bell:

"SUB AUSPICIO VIRI VENERANDI ONESIMI SOCIETATIS
EPHRATENSIS PRAEPOSITI"³

Had Fate not intervened, the bell would have been received by a new superintendent, the former Prior Onesimus! The first impulse was to smash the bell but later it was sold. At present the bell is on display at Grace Lutheran Church in Lancaster.⁴

With the expulsion, all contracts and orders held by the mills were cancelled. Enemies of the Cloisters seized upon this opportunity to advertise joyfully that the Cloister mills were closed permanently. Consternation and anger were heard in trade circles, while anxious customers sought new sources of flour, oil, paper, and cloth. The purge had a disruptive effect upon commerce in the Philadelphia area as well as crippling the Cloister economy. But until Beissel could evaluate the commercial phase and decide which mills were to be operated, industry was at a standstill. The grist mills were the first to be re-opened, followed by the paper mill, and then to a limited degree, the others. All of the products were to be used for maintaining the community and the impoverished. Small quantities of paper were made for both the Ephrata press and trade. Once more the mills became only an auxiliary to the religious community.

A ripple of spiritual renaissance swept the community for a short time; however, the deterioration progressed, interrupted only occasionally by Beissel's attempts to bring new blood to his community. The years of the Eckerling regime had left a spiritually effete society. The toxins of disillusionment, cynicism, and near-slavery had permeated the fibre of the Cloister.

Twenty-three years after the expulsion, Beissel was freed from his earthly labors. The seventy-eight-year-old anchorite came to the end of a stormy career July 6, 1768. To his credit it must be noted he grew more placid and liberal, and at times, even remarkably noble as he submitted to the physical discipline demanded by old age. There is evidence, on the other hand, that many of his problems found resolution through a more prevalent spirituous medium.

³ "Ordered by the authority of the venerable prior, Onesimus, appointed by the Society of Ephrata."

⁴ Originally the bell was sold to Holy Trinity Church (Lutheran) in Lancaster. Later it was purchased for the Washington Fire Company of Lancaster. When the fire company was absorbed into the city fire department, the bell was acquired for Grace Lutheran Church by J. F. Sener, where it served until cracking, after which it was mounted for exhibition by the church.

With Beissel had gone the magnetism, the memories of an indomitable leader. His monument was a group of nearly vacant structures which housed a few ancient brothers and a score of sisters well past their prime. Johann Peter Miller assumed the leadership at a time when nothing short of a miracle could restore the Cloisters to its former status. But Miller, the mild intellectual, was unable to do more than soften the decline. That Peter Miller was not a leader is the opinion of most historians; however, his ability to sustain a dying economy for twenty-six years is evidence of his devotion to humanity.

A few days after Washington's defeat at Brandywine (September 11, 1777), endless trains of wagons bearing the American wounded started to arrive at Ephrata. The buildings of the Cloister were turned into hospitals. Brothers and sisters immediately set to the task of caring for the wounded. Despite the deadly fevers which raged out of control, deaths were kept at less than two hundred. Many of the brethren and sisters were stricken fatally in their work of mercy. General Washington and the military heads of the Continental Army had the highest praise for the service given by those of the Cloisters. Tributes given Peter Miller carried superlatives worthy of few mortals. (A full account of the military hospital is given in Vol. 51, No. 5, by C. H. Martin, L.C.H.S. Papers.)

Following their use as hospitals several of the large convents were fired to prevent spread of disease. These were the buildings formerly used by the Brotherhood of Zion, located just a few yards northeast of the Soldiers' Monument in Mount Zion Cemetery. The sister house, formerly Hebron, now called Saron; its chapel or "Saal"; and the brother house, Bethania, and its "Saal," were all that remained. About 1911, Bethania was pulled down; its "Saal" suffered demolition sometime during the mid-nineteenth century.

Peter Miller continued to administer the Cloister until his death in 1796. By that time the Cloisters had become a home for the aged members, and after Miller's passing, responsible householders in the community maintained the institution. In 1814, when only four persons were left in the religious orders, the Cloisters were incorporated. At various times the trustees were permitted by Acts of Legislature to sell parcels of land and the mills in order to maintain the convent. It is necessary to explain many of the householders resided in the convents following their days of usefulness. At the time of incorporation the Seventh Day Baptist Church came into the picture. Briefly what happened was the conversion of Beissel's work into an episcopal, evangelical organization which most nearly represented the earlier tenets. A few years prior to his death, Beissel became interested in several religious communities in south-central Pennsylvania: The Bermudian in York County; Snow Hill in Franklin County; and Stony Creek in Bedford County. The relationship of these to Ephrata was obscure and never constant. At present the German branch of the Seventh-Day Baptist Church has only three congregations: Ephrata, Snow Hill, and "The Cove" near New Enterprise, Bedford County.

In 1934 the state began legal proceedings to acquire the property for restoration, which resulted in forfeiture of the Society's charter. The Penn-

sylvania Assembly passed an Act which authorized condemnation of the property, and administration by the State Historical Commission. In the summer of 1941, Mr. G. Edwin Brumbaugh, one of America's most noted restoration architects, was commissioned to commence stabilization and restoration of the property. Despite financial and manpower problems the buildings are assuming gradually their original appearance along with concealed improvements which promise to protect the buildings from the effects of time for several more centuries.

Appendix A.

Major Buildings Erected Within The Ephrata Cloisters

- BERGHAUS (Hill House), built approx. 1733. Located on Zion Hill. Used by first brothers: The Eckerlings and Peter Miller.
- KEDAR, built 1735. Located on Zion Hill. Used as dormitory and meetinghouse.
- BETHAUS (Prayerhouse), built approx. 1736. Located on Zion Hill. Razed four years after erection.
- ZION MONASTERY, built 1738. Located on Zion Hill. For use of the Brotherhood.
- ZION PRAYERHOUSE, built 1740. Located on Zion Hill. Originally for the Brotherhood's use.
- PENIEL (SAAL), built 1741. Located east of Zion Hill. Used as prayerhouse. Restored.
- HEBRON (SARON), built 1743. Adjoins Peniel at right angle, forming "L" shaped mass. Used as convent. Restored.
- BETHANIA, built 1746. Located in lower meadow, south of Peniel. Used as brothers' house after Eckerling expulsion. Razed 1911. To be rebuilt.
- BROTHER SAAL, built 1746 or 1747. Adjoined Bethania at right angle. Used as prayerhouse, and later as school and print shop.

Appendix B.

Schedule of Hours

Midnight to 1:00 A. M.	Matin
1:00 A. M. to 5:00 A. M.	Sleep
5:00 A. M. to 6:00 A. M.	Second Matin
6:00 A. M. to 9:00 A. M.	Labour
9:00 A. M.	Breakfast
9:30 A. M. to 6:00 P. M.	Labour
6:00 P. M.	Dinner
7:00 P. M. to 9 P. M.	Writing, Reading Study
9:00 P. M. to Midnight	Sleep

II. Cloister Industries

The chief industries of the Cloister fell into four categories: Flour-milling, Lumber, Textile, and those related to the Graphic Arts. Naturally, the first interest was to secure adequate food and shelter. Having made some progress in this direction, the Eckerlings turned their attentions to adding facilities for publishing.

The Grist Mills

A grist mill had been purchased sometime prior to 1741, and its milling capacity increased by adding two more runs of stones, thus making a total of three runs, or pairs of millstones. The structure was located nearly a mile southwest of the Cloister proper, along the Cocalico close by the original Lancaster-Ephrata turnpike. The Cocalico forms an elbow at this point, so the mill race was cut across the projecting land. Dammed at the head of the race, the waters of the Cocalico had a six-foot drop into the race before flowing several hundred feet into the mill wheel-pit. The Cocalico was a dependable water source.

Before the Eckerlings enlarged the grist mill, it was a one-story mill of limestone construction, quoined with brown sandstone. The Eckerlings added another story to the mill, and this section, including quoins, was of limestone. With the new stones in operation, and the additional garnerers in readiness, the mill was able to supply the Cloister bakery, and still have tons of flour available to sell on the Philadelphia market.

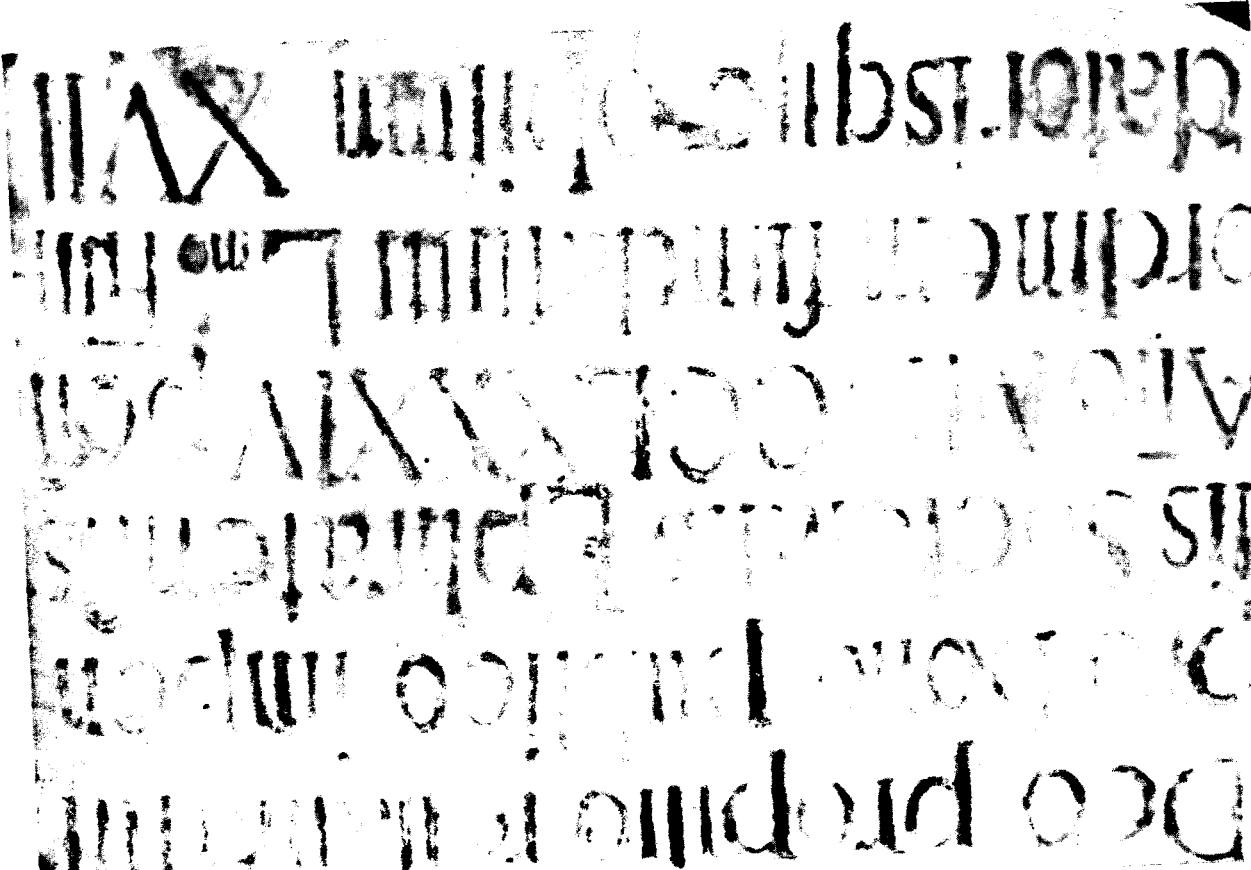
In 1747, after the expulsion of the Eckerlings, this mill, along with others, was destroyed by fire. Not only was the machinery ruined, but four hundred bushels of grain were lost. By 1748 these mills had been rebuilt and were in operation once more. Thirty-six years later this grist mill had become fairly worn-out, so the Brotherhood survivors again renovated the structure, climaxing their efforts with a date stone inscribed as follows:

"Deo propitio restaurati pro bono publico impensis Societatis
Ephratensis Ano MDCCLXXXIV post ordinem fundatum Lmo
Fundatorisque obitum XVII."⁵

In 1755, John and Margaret Bowman entered into an agreement⁶ with the trustees of the Society "for and in consideration of the kindness, brotherly love and affection of our fellow brother and sister, John Bowman and Margaret, his wife, in giving, granting, and confirming unto us and our successors in behalf of the Society of Ephrata full right[s], liberty, and

⁵ "Restored by God's favour, and for the public good, at the expense of the Ephrata Society, in 1784, the fiftieth year after the establishment of the order and the seventeenth year after the death of the founder." The stone is now in the Landis Valley Museum. (See illustration on page 164. By courtesy of *The American-German Review*).

⁶ Agreement is dated August 1, 1755. Many sources have interpreted this agreement to mean the Bowmans donated the mill and three acres of land to the Cloister for a period of thirty years.



privilege for so much water of Cogolico [Cocalico] Creek conveyed by a mill-damm and race on the John Bowman's Land for or at any time continually for the space of nine whole months in every year as may be fully sufficient for an undershot grist mill—and so much as may be more than what our said Brother John Bowman . . . may use for his . . . hemp and barley mill in the three other months, that is, September, October, and November.” The next year John Bowman erected a brick mill southeast of the Cloister proper close by the Downingtown-Harrisburg Turnpike bridge. His mill was powered from the Cocalico by means of a long, straight canal or race running eastward from the mill, and discharging into the creek near the baptistry near the meadow spring. Bowman permitted the Society the use of his mill for thirty years at one time, and later the mill augmented the papermaking facilities of the Cloister. After numerous changes, the original structure has come down to the present as part of the Moyer knitted wear factory. It left the ownership of the Cloister in 1836.

The grist mill, like the other mills, was constructed in the mechanical style prevailing in the Rhineland during the seventeenth and eighteenth centuries. The mill-seat along the Cocalico presented problems not common in the New England colonies, for the general flatness of the land added to the difficulties of securing sufficient water power. Because of its age, the Cocalico resembles to some extent the watercourses of the Lower Rhine. To overcome the problem of adequate power for the concentrated cluster of industries, the Brotherhood millwrights were called upon to exhibit competency worthy of admiration by the most ingenious modern engineers. Rhenish millwrights generally considered the functioning of the mill more important than giving attention to graceful proportions and other refinements so dear to the English and French mechanics.⁷ German machinery, therefore, frequently was heavy and cumbersome. The basic design of German machinery changed very little until the advent of cast and forged iron machinery in the early nineteenth century.

Millwright apprentices worked under the direction of master mechanics, and frequently they compiled plan books which contained rough drawings, dimensions, and calculations taken from standard machines. In this way machinery retained features for many generations, being improved only when necessary. By comparing machinery of various sections in the colonies with their counterparts in the native sections of their designers, it is not difficult to observe many identical features in machine design, power transmission, and use of component material. By cautious deduction, the relative characteristics of the Cloister mills can be determined. Such deduction needs not depend wholly upon hypothetical means, for sufficient evidence remains by which definite mechanical description can be made, as, for example, archaeological remains, ruins of earthworks, comparative measurements of flow and water discharge, productive output, and even quality of the product.

The Cloister grist mill was typical of Rhenish mills. An undershot or breast wheel was turned by the water flowing in the mill race. Where a

⁷ Diderot's "*Encyclopédie*"; der Katalog, Deutsches Museum, Munich.

deep, swift stream was available, the wheel was located frequently on the exterior of the mill, operating with the current of the stream. At least the majority of the Cloister mills had their water wheels placed in a wheel-pit inside the mill. Usually a broad arch low in the mill's wall indicates the wheel was located inside.

Regardless of the wheel's location, its shaft always extended to the under-husk gearing whose function was to transmit motion, at a different speed, vertically to the grinding floor.

That part of the mill which bore the heavy stones and gearing was known as the husk, and its sturdy framework was erected independently of the mill structure to prevent damage from vibration. On top of the stout pillars and beams, all mortised together, was the grinding floor. The level of this floor usually occurred slightly above the ground or first story level. Protruding through the floor were the shafts or spindles upon which the iron-bearing yokes were supported, which in turn supported and turned the millstones. Around each set of stones (bed or nether stone and upper or runner stone) was built a bin or chest, and over the bin was placed a hopper which directed the flow of grain into the eye of the runner stone.

The part of the mill involving the greatest ingenuity was the gearing. The early Rhenish mills had gearing constructed entirely of wood, and those at Ephrata followed the pattern, considering the abundance of good oak, and the lack of iron forgings and castings. An essential material for wooden cog teeth was apple wood which was obtained locally. *Lignum Vitae* (*Guaiaecum officinale*) was the favourite bearing material of the millwrights, and without doubt, the Eckerlings secured their "Pockholz" from West Indian traders. Detailed description of the gearing will be noted on the diagram.

Of extraordinary interest is the source of millstones, for the Cloister mechanics were among the first to discover the qualities of the famous "Cocalico stone" of their vicinity.

The Saw Mill

The first building at the Cloister was the stone Berkhaus. With the exception of the Almonry and the mills, all other buildings erected at Ephrata were chiefly wooden. To prepare the tremendous quantity of lumber, timbers, beams, and posts a saw mill was put in operation. According to the *Chronicon Ephratense*, the saw mill was adjacent to the original grist mill, and was saved from serious damage when the grist mill burned by a stack of logs which stood in the path of the flames.⁸

Trees felled in nearby forest land were brought to the mill by teams of beasts. John Peter Miller gave the matter of floating logs downstream solemn academic study, even to the extent of submitting a paper on the subject to the American Philosophical Society of which he was an invited member. However, it is not to be supposed that the Eckerlings attempted to establish rafting on the Cocalico, despite the experimentation.

⁸ *Chronicon Ephratense*, p. 211 (Hark Translation).

The type of sawmill in operation at Ephrata would have been the reciprocating water-powered machine, little-changed during the four centuries it was known in Germany. We may note with interest that the Ephrata sawmill passed out of existence *before* a sawmill had been set up in England!⁹

The reciprocating saw consisted of a straight blade, serrated on one edge, and stretched between the ends of a frame. As the water wheel transmitted motion through the gearing to the "pitman," the frame was caused to slide up and down, sawing the log as it was forced along on its carriage. A saw of this type was capable of preparing two thousand feet of lumber in ten hours. The technical details of this mill are shown on another page.

The Fulling Mill

Having satisfied their food and shelter problems, the Eckerling management turned its attention to the advantages to be gained by finishing the woollen cloth woven on the Cloister looms. To operate a fulling mill economically, sufficient cloth must be constantly available. Since weaving facilities at the Cloister were somewhat limited, and probably sufficient only for community needs, the mill was operated on the "toll" basis, the Eckerlings keeping a small portion of the cloth, or perhaps accepting another commodity in exchange. Fulling mills were not common in the province in the middle of the eighteenth century. Farmers around the countryside doubtless were pleased to have the Ephrata Brotherhood discharge this laborious task for them! Not even Germantown could boast of a fulling mill!

The process of fulling requires a machine which pounds and beats the woollen cloth in the presence of Fuller's Earth. The "earth," known to the settlers as "Walkererde," absorbed the grease and oil in the cloth. Heavy wooden stocks or hammers were mechanically dropped on the cloth, which soaked in a trough. This action not only cleaned the cloth, but the looseness of the fabric was condensed into a tighter mass. The water-powered action of the fulling mill is shown elsewhere. The fulling mill was a victim of the aforementioned fire.

Before turning to the major industries, mention is warranted with respect to the leather trades. Tannery vats were installed in the meadow and a bark mill was set up nearby. A beast plodding slowly around a vertical shaft turned the bark stone; its milled surface crushing the oak bark. Complete operations for tanning and tawing were established. According to many records, the chief product was the skin of sheep, although other leathers doubtless were prepared. Shoemaking was carried onto some extent, but the greatest demand for leather came from the Cloister bookbinding.

Industries Related to the Graphic Arts

Gutenberg's invention of printing was no more fully appreciated than by the German religionists. Publishing one's revelations and thoughts became

⁹ The first sawmill was erected in England in 1768, but was soon destroyed by organized sawyers who feared loss of employment.

almost an obsession with the Cloister zealots. Israel Eckerling also realized Pennsylvania's printing requirements placed a heavy demand on local manufacturers of paper and ink. Accordingly, in 1736, a paper mill was established on the banks of the Cocalico—the fourth paper mill in Pennsylvania, and probably seventh in the New World.¹⁰

The Paper Mill

What the Cloister mill lacked in seniority was easily compensated by its unusual production of high-quality papers for printing and writing, and a coarse brown "macalatur" for common usage. Contemporary accounts would indicate the Eckerlings manufactured a prodigious quantity of paper for the hungry market; the Cloister mill was the most productive, if not the largest, in the Colonies.

Located near the other mills already described, it was nevertheless safe from the fire of 1747. The paper mill operated under the supervision of the Martin Funk family, experienced German papermakers. Dard Hunter has assumed the management to have been under the sons, Jacob and Samuel, who acquired the trade in Germany.¹¹ We may question this inasmuch as Jacob and Samuel would have been eleven and seventeen years of age, respectively, when the Ephrata mill was established. The Funks had little authority over the mill after the Eckerling expulsion nine years later, although they continued to produce paper on a limited basis.

The paper mill doubtless was similar to those which dotted the German valleys. The process was the first to involve the division of labour, which appears significant in this major industry of the chief industrial center of the Colonies. For the necessary division of labour, papermakers were among the first to meet the challenge of the industrial revolution. Papermakers enjoyed a certain prestige.¹² They were beyond the jurisdiction of the craft guilds because most master papermakers *were masters in one operation only*, and few could make a perfect sheet individually.

The workmen of the paper mill included the vatman, coucher, layman, stamper, and pressman. Other labourers were required for sorting rags, hanging paper to dry, and other simple tasks. Clearly one can see the paper mill was a large operation even when of modest size.

No less than six men were required for each vat of pulp; the mill at Ephrata had at least three vats and quite possibly more, considering their rate of production. The rag sorter separated the rags after which they were macerated in the stamping mill. This machine consisted of a long trough into which a gentle stream of water flowed, and a frame of stampers which dropped into the trough in staggered sequence as they were raised by cams

¹⁰ (1) Rittenhouse, 1690; (2) DeWees, 1710; (3) Bradford, 1726; (4) Milton, Mass., 1728; (5) Willcox, 1729; (6) Falmouth, Maine, 1734; (7) Cloister, Ephrata, 1736.

¹¹ Dard Hunter, "Papermaking," p. 277.

¹² G. Schaefer and A. Latour, "Paper Trade Before the Invention of the Paper-Machine," CIBA Review, Basle, p. 2651.

on a water-powered shaft. The stampers macerated the rags while the impurities were floated away by the stream. After the rags became pulp, the thick liquid was transferred to the vat. The vat was a large wooden tub, five or six feet in diameter, and waist-high. Supported over the vat, and projecting down into the vat, was a drain-horn. The vatman, who was the chief operator, stood by the vat and dipped the mould¹³ down into the pulp, deftly turning it to receive the proper layer of the watery paper mass. When the vatman's skilled eye decided the mould was sufficiently covered, the vatman would slip the mould out of the vat, remove the deckle,¹⁴ and pass the mould to the coucher who inclined it over the tub, permitting the surplus fluid to return to the tub. As soon as the wet sheet had formed the proper consistency, the coucher upset the mould and slipped the paper unto a woollen pad, after which an accumulation of 144 such sheets would be placed in a heavy screw press. After pressing, the paper would be dried on racks or ropes. Since the Cloister mill did not produce any glazed or highly-polished papers, apparatus for burnishing was not necessary. The Cloister's writing papers were sized as may be seen by studying the beautiful *fraktur* or illuminated writings of the sisters. Without sizing, the inks and colours would have flowed into the fibres of the paper.

The story behind the Cloister paper is best learned by examination of the mould upon which the paper was fabricated. Although the moulds have long since disappeared, sheets of old Cloister paper bear silent witness to the character of these historic tools. Mould-making itself involves several skilled trades which will not be described here, for the Cloister moulds were purchased from the Germantown craftsman, Isaac Langle, rather than being manufactured at Ephrata. Langle was America's first mould-maker. It is also established that he supplied Ephrata with moulds as early as 1740.¹⁵

Moulds governed the texture and line impressions in paper; the number of laid lines and chain lines, and the watermarks were the keys to the paper's maker. Examinations of Cloister paper shows the chain lines were 1.03 inches apart, while 24 laid lines appear for each inch.

Watermarks of the Cloister mill paper are original and contain a range of designs, from the practical to the mystical. During the period of the Funk family supervision their personal marks "FB" and "RF" appeared on much of the paper. The latter watermark was completed with a double-lined number "4" which the mystics tell us was the "perfect number." The "FB" doubtless referred to the "Funk Brüder." Copies of the *Theosophische*

¹³ The mould was the most important hand tool of the papermaking process. It varied in size depending upon the size of each sheet of paper to be made. Essentially a wooden frame constructed to resist warpage and decay, it held a grid of wires and ribs which supported the web. These wires left on the paper "laid and chain" marks which may be observed on most hand-made papers. If a watermark was desired, a design in wire was fastened on the wire grid.

¹⁴ The deckle was a removable wooden rim which retained the fluid pulp on the mould, and which determined the rough edge of the sheet.

¹⁵ Dard Hunter, "Papermaking," p. 124.

Lectiōnen bear the "R-4-F" mark.¹⁶ Probably Ephrata's most outstanding watermark was that symbolic design used by the Zionitic Brotherhood during the Eckerling regime. This cross and keys watermark honoured the *Clavicula Salomonis*¹⁷ upon which the Brüderschaft based many of their speculations.

Post-horns, scalloped hearts, and crowns also left their mark on the Cloister paper. Some paper discovered at the Cloister many years ago by Dard Hunter¹⁸ contained a mark which Dr. Hunter was unable to interpret, but which now appears to have been designed for the purpose of preserving books from any literary auto-da-fé. If this paper was manufactured under the direction of the Eckerlings the mark fulfilled its purpose! Since the majority of the Eckerling works was thrown to the flames we have no way of determining what influenced the selection of watermarks for special publications. We do know, however, that Beissel ordered the use of a heart-shaped watermark bearing his initials "CB" after the Eckerlings were deposed.

After the expulsion, the manufacture of paper was halted until the Cloister press created a need for more paper, after which the mills were re-opened for non-profit production of paper on a limited basis. In 1828 the Bauman mill, which had been operated as an auxiliary to the main mill, was sold along with three acres of land which comprised the triangle of land near the turnpike bridge. By 1842, when the remaining mills were sold, the main paper mill had disappeared into oblivion. Nature had claimed the Cloister's most significant industry!

The Oil Mill

The prime ingredient of early printing ink was linseed oil. The abundance of flax crops in southeastern Pennsylvania not only satisfied the domestic demand for fibre, oil, and seed, but great quantities of oil and seed were exported.¹⁹ Moreover, flaxseed was a by-product of the fibres which became linen, and therefore, the conversion of seed into oil was economically practical wherever flax was grown.

Establishment of an oil mill was rapidly undertaken by the Eckerlings soon after their ascent to power. The mill must have been quite remarkable, for the *Chronicon* states, "... a skillfully built oil-mill, with stones the like of which none before existed in America . . . [was destroyed]".²⁰

The oil mill consisted of two stone "wheels" very similar in appearance to regular mill stones, but which rotated on their edges about a circular path. A horizontal axle passed through the stones' center, and this axle was turned by a stout vertical shaft powered by a water wheel. In Europe

¹⁶ The *Lectiōnen* were confessions and statements of condition written by members and read before the meetings by Beissel. The first were printed in 1752, probably seven years after the manufacture of the paper.

¹⁷ "The Keys of Solomon," a mystical book of the seventeenth century.

¹⁸ Dr. Hunter, probably the most outstanding authority on paper to ever live, uncovered the rare paper under wreckage of the Bethania, razed about 1912.

¹⁹ John Almon, *Tracts*, (London 1766-67), III, 31.

²⁰ *Chronicon Ephratense*, p. 211.

many oil mills were driven by beasts travelling endlessly in a circle.²¹ Both water and animal-powered mills contained also presses for the further extraction of oil from the flaxseed. Models in the "Home Museum" at Krefeld show the press to have been operated off the gearing which actuated the mill, although water-powered oil mills²² owned by John and Peter Hillegass along the Perkiomen Creek in 1802 employed manual plungers for pressing. Destruction of the Cloister mill has left us only the knowledge that the stones were water-powered; we can only speculate as to whether the Ephrata mechanics erected their press in their native Rhenish design, or if the Alsatian method was employed.

In processing the oil, flaxseed was placed in a large stone basin beneath the huge crushing rollers. The oil and crushed seeds were separated, and the fibrous pulp was placed in jute bags in the press. After all the oil was obtained it was heated and ready for inkmaking,²³ which took place at some distance from the buildings.

The Printing Shop

The Cloister printery was unable to share in the prosperity-producing features of the Cloister, for it was established only a short time before the Eckerling expulsion. Many references erroneously claim the press began operating *after* the Eckerlings left. We have the *Chronicon's* description of incidents which led to the expulsion in which John Peter Miller and Israel Eckerling were working side by side at the composing cases.²⁴ Moreover, other printed papers *produced by the Eckerlings* were burned. It is interesting to ponder what could have happened had the Eckerlings been able to control the press for any length of time.

The print shop was located originally in a separate building, probably close to the Brotherhood buildings on Zion Hill. Later it was moved to the Brothers' House (Bethania) where a gradual dispersal of equipment took place during the last century.

Equipment of the printery was similar to most print shops of the middle eighteenth century. One or several presses, composing cases, galley proof press, imposing table, and various small tools comprised the typical shop. The Cloister shop apparently began with a large and a small press, both

²¹ Die Heimat, No. 8, p. 129 (Krefeld, Germany, July 15, 1929).

²² The Perkiomen Oil Mills, operated by the Hillegass brothers—among the earliest of the Reformed Church settlers—were reputed to have produced the finest linseed oil for painting that was obtainable in America, until the advent of specialized iron rollers after the Civil War. The National Lead Company has confirmed the usage of wedge presses as described, employed in the Perkiomen Mills.

²³ Lampblack was mixed with the linseed oil and the black sticky mass was boiled amidst a smoky stench.

²⁴ *Chronicon Ephratense*, p. 180. Peter Miller said to the Prior (Israel Eckerling), "Why did you cashier the Superintendent?" Replied the Prior, "That is none of your business; you attend to your work." At that instant, the Superintendent (Beissel) entered the printing office to speak privately with Miller, and to evaluate his forces in the approaching struggle for control.

imported. After short service, the small press was sold to the Moravians at Bethlehem, and a new, larger one was purchased for replacement. Details of the one press will be sketched elsewhere. At present the one press is on exhibit at the Cloister, while the other is in the Historical Society of Pennsylvania Museum. Fonts of type used by "*Die Presse der Brüderschaft*" contained both English and German characters, all imported from England and Nürnberg, Germany. The Ephrata printery was the first in America to publish in both languages.²⁵

Publications issued during the remainder of the Eckerling regime concerned chiefly attempts by the Eckerlings to reveal a theosophy superior to that of Beissel, and to condemn the Moravians at Bethlehem with whom the Ephrata mystics maintained an endless feud.²⁶ After the expulsion the press was inactive until 1747, when publication was resumed on a different basis, viz., to evangelize without profit. With this altruistic policy, the Ephrata Society press continued to operate until 1794, producing dozens of religious pamphlets, volumes, broadsides; and numerous secular works including pharmacopoeiae. In 1745, ten publications were issued; one or several issues were made yearly from 1747 until 1759 when printing surged to high and constant level for the next ten years. After 1770, publishing dropped off and became more or less infrequent, and during an interval, 1777 to 1782, nothing was issued. Beginning in 1784 and continuing until 1794, the press enjoyed another spurt of prosperity, although by this time it was hardly more significant than a small job-printing shop. In 1794 the equipment passed into the hands of secular printers including Joseph Bauman, Solomon Mayer, and J. E. Pfautz. The last-named printer employed the ancient type along with newer characters in 1858 to publish a little German-English hymnbook containing many selections from the Cloister hymnals, most of them profuse with gloom and morbid sentiments.²⁷

The printery was ably staffed with Continentally-trained proof-readers, and at the head, the scholarly John Peter Miller and his learned associate, John Hildebrand, translated and corrected the ponderous volumes. In the declining years of the press, Ludwig Höcker, the school teacher, assumed the duties as printer.

By far the largest task undertaken by the Cloister printers was the publication of the Mennonite "Book of Martyrs" (*Martyrer Spiegel*) begun in 1748. Three years were required for the job, and Peter Miller translated the volume from Low Dutch to High German, resting only four hours each day until the translation was complete. The *Chronicon* tells us "... fifteen Brethren were detailed, nine of whom had their work assigned in the printing department, namely, one corrector, who was at the same time the translator (Miller), four compositors and four pressmen; the rest had their

²⁵ Benj. Franklin was the second printer to use both fonts, 1747.

²⁶ Condemnations of the Moravians included such accusations as, "wicked rabble", "... structure of ... deceit and sham."

²⁷ A copy of Pfautz's "Collection of Pearls or Spiritual Hymns" has come down the family of the writer.

work in the paper mill." The remaining six employed in the paper mill confirm the traditional necessity of requiring a complement of six men for each vat. The account given by the *Chronicon* mentions that frequently paper was lacking, thus slowing the work of the printers. From this we can conclude only one vat was placed in operation for this task, although the original capacity *under the profitable Eckerling management* was several times greater. Other references appearing in the *Chronicon* indicate a constant state of indebtedness during the post-expulsion period. After the Mennonites fulfilled their part of the contract the Cloister became temporarily solvent.

The "Book of Martyrs" was brought out in folio form (four pages folded from a single sheet), and required sixteen quires or 384 sheets per volume. This edition was complete with 1300 copies, thus nearly 1200 reams of paper were required, considering the waste factor of that period. The enormity of this task becomes apparent when one realizes each sheet of paper was formed by hand, and printed page by page on the hand presses.

The magnitude of Ephrata's industries can be seen from several phases by which standards of comparison are set. In value of installed machinery and buildings, the mills represented an investment of nearly \$10,000, according to statistics reported by the early American economist, Tench Cox. In expense, the equipping of a complete slitting and iron rolling mill would have been similar. The plans for the future included many ambitious projects. The Eckerlings had excellent domestic and foreign markets; inexpensive resources and labour; and the ability to exploit each one fully. Had the Eckerlings continued in power up to the time of the Revolution, doubtless the British would have pressed inland to seize the Cloister mills. Such an attack would have cut Washington's armies off from the source of their field pieces. The Continental Congress probably would have passed beyond Lancaster; indeed, Lancaster might have been evacuated had the British occupied Ephrata.

Christopher Marshall of Lancaster, and John Wister of Germantown, were agents for the Cloister products.

Notes

The mills of the Cloister were able to operate most of the year according to careful investigation into the matter of stream flow, run-off, and discharge of the Cocalico. The drainage area upstream from the mill site comprises approximately 93 square miles, and the discharge ranges from 170 cubic feet per second in early March to 20 feet in June. The above calculations consider the run-off characteristics of Triassic conglomerate rock and its soil. With a six-foot head, the water power would have been sufficient to provide for most demands even during June and July.

The construction of the dam can be reasonably ascertained by the ruins. Apparently it was an earth dam with a masonry rip-rap upstream surface.

The prominence enjoyed by the paper mill brought to it many visitors, and at least one student. The early Moravian settlement at Salem, North Carolina, granted approval to one of its members to build a paper mill at Salem. The following is taken from the *Salem Diary*, 1789, page 2269:

"Sept. 8— . . . With the approval of the Aeltestes Conferenz and the Aufseher Collegium, Br. Gottlieb Schober plans to build a paper-mill and employ Br. Christian Stauber as papermaker. The latter left for Pennsylvania today to learn papermaking in Ephrata."

From the *Salem Board Minutes*, 1789, page 2279:

"July 21—Christian Stauber has written to the Conference that he cannot continue in the tailor's business because of his health, and asks permission, if Br. Schober builds a paper-mill, to go to Ephrata to learn that art and then he can serve here in the paper-mill. There was no objection, but Br. Stauber must wait until fall, partly to instruct his successor . . . and partly to give Br. Schober time to hear from Ephrata whether they will be willing to have someone come from here to learn the art."

What healthful conditions Br. Stauber saw in the damp, cold paper-mill is a bit obscure!

Many stories of the Cloister school have come to us by tradition. The Ephrata Academy was established in 1837 to provide a sound classical education for many fortunate young men. One of these early teachers was Barton McCord, grandfather of Mrs. William Rote. Schoolmaster McCord came from Chester County, and lived in the former Brother House with his wife and large family. At the outbreak of the War Between the States, he organized a battalion at Ephrata.

Paper for gun-wadding was confiscated by Colonel Bartram Galbraith of the Continental Armies, and was carried away from the Cloisters in the form of unbound copies of "Der Blutige Schauplaz, oder Martyer Spiegel der Tauffts Gesinten" (Martyrs' Mirror). The heavy grade of paper was excellent for wadding. The Cloisters were paid for the paper, and later some of the copies were saved from destruction.

Paper money was printed at the Cloisters for the Continental Congress during the time at which the Congress sat at York. Official work, however, did not include the translation of the Declaration of Independence by John Peter Miller, as reported by some historians.

Explanatory Notes on Following Drawings

PLATE 1

THE GRIST MILL, showing the one surviving mill at the mill-site. Isometric view is of typical grist mill. Water wheel (A) turns crown cog which engages lantern pinion or wallower (B) on lower end of shaft. Great spur cob (C) engages flat trundles (D) which rotate millstones. Upper stone or runner (F) is kept clear of bedstone or nether stone by adjustment of bridgetree by hand wheel (E). Millstone spindle is borne in step, or bridge-pot. Grain is fed into stone eye from vibrating hopper. Flour is ground as wheat moves outward in furrows of millstone, and chute carries it down to chest. Large storage bins (garners) and bolting machinery were located in the upper floors of the mill. Power was taken off the gearing to operate the bolting and hoisting machines.

PLATE 2

THE PAPER MILL MACHINERY. The Stampers were iron-shod posts which dropped into the pulp rags by the lifting action of the cams on the shaft. As the cam rotated beyond the arc of the stamper helve, the stamper fell heavily into the pulp, thus macerating the rags. Next the pulp was placed in vats from which the vatman lifted the mould and the web of pulp. The mould is shown cut-away and partially in cross-section. The wires (A) form the web of paper. These are "laid" wires, and are supported by backing wires (B). The wedge-shaped rib (C) supports the wires, and is itself braced by heavier wires (D). The wedge-shaped section causes a suction as the mould is taken from the pulp, thus retaining a film of pulp on the wires. The removable deckle helps retain the web, and defines the size of the paper. The press is operated by turning the screw, bringing down the block against the wet paper and layers of felts.

PLATE 3

THE FULLING MILL, shown at top, consisted of a battery of hammers which were lifted alternately by cams of a turning shaft, and which fell against the woven fabric with a scrubbing action. The operators kneaded the cloth under the hammers, or "Stiel," which caused the oils and greases to flow away, and which compacted the fabric. Fuller's Earth was used to remove the impurities. An enlarged hammer is shown.

THE OIL MILL was a stone basin in which rotated a pair of stone chasers. The drawing shows a type of mill peculiar to the Palatinate. After the flaxseed was crushed under the stone rollers it was put in rough bags which were then pressed as shown. The falling beam drove the wedge between the bags causing the oil to trickle out where it was collected.

THE SAW MILL was an early type of reciprocating frame-saw. Minus such later refinements as mechanical ratchet feed, the saw was stretched in a frame which slid up and down between two fender posts. The frame was moved by the reciprocating action of a cogwheel on a water-wheel shaft.

PLATE 4

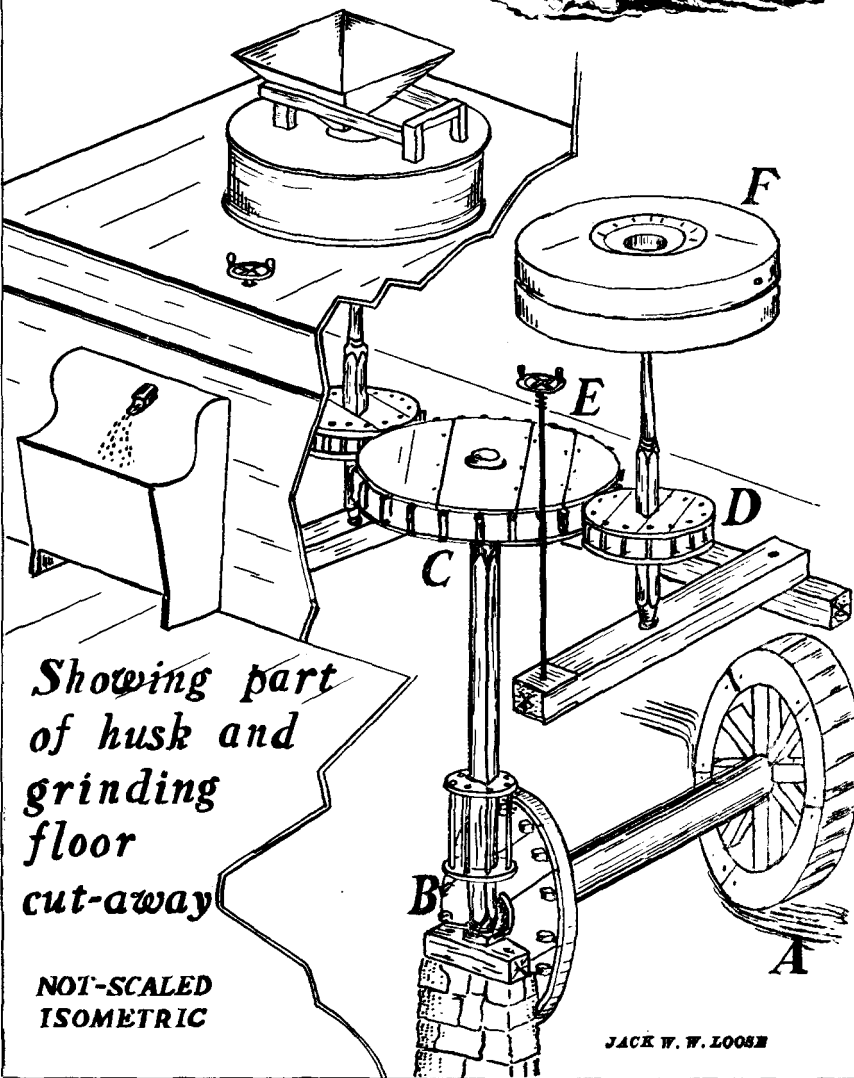
THE PRINTING PRESS: Early handcrew type press. Approximately six feet high. A metal type vignette used by the Cloisters is shown; it represents a German pilgrim.

WATERMARKS used by the Cloister Paper Mill. The "Keys of Solomon" are on the left. These designs are made of wire and fastened on the wire of the paper mould.

A GRAPHIC CHART portraying the relation of selected influential factors is given to express in proportion the length of time enjoyed by these factors.

GRIST MILL

PLATE 1



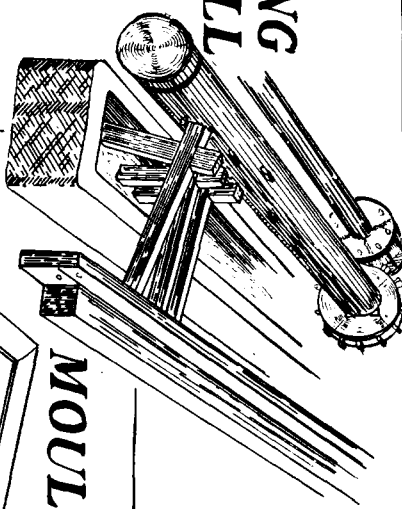
*Showing part
of husk and
grinding
floor
cut-away*

**NOT-SCALED
ISOMETRIC**

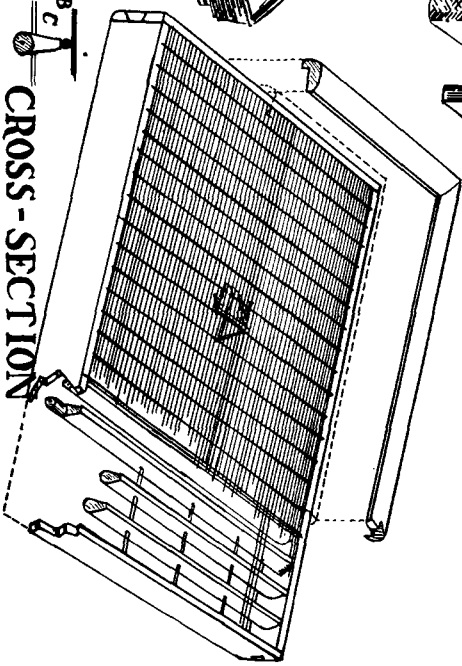
JACK W. W. LOOSE

PAPER MILL

STAMPING MILL PAPER PRESS

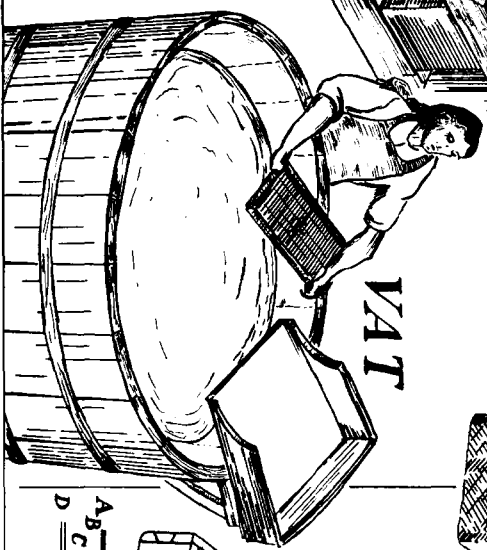


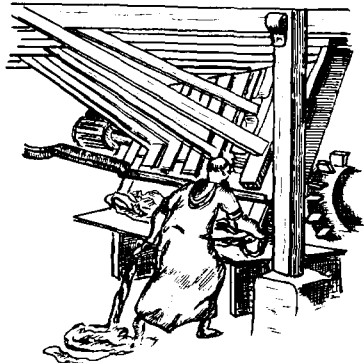
MOULD & DECKLE



CROSS - SECTION

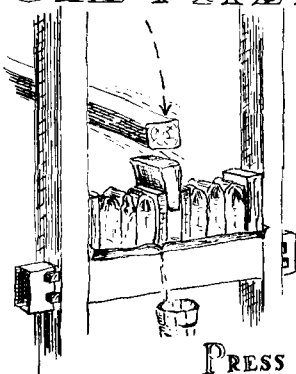
VAT



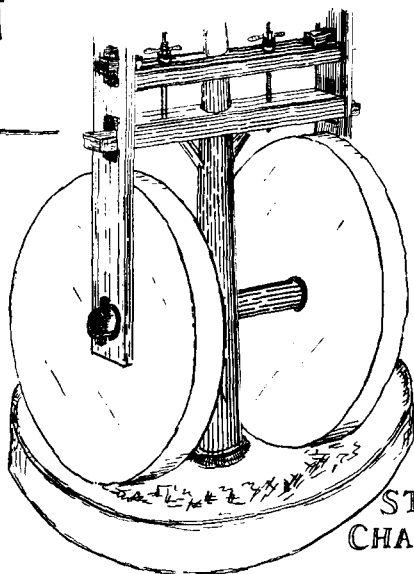


STIEL
FULLING MILL

OIL MILL

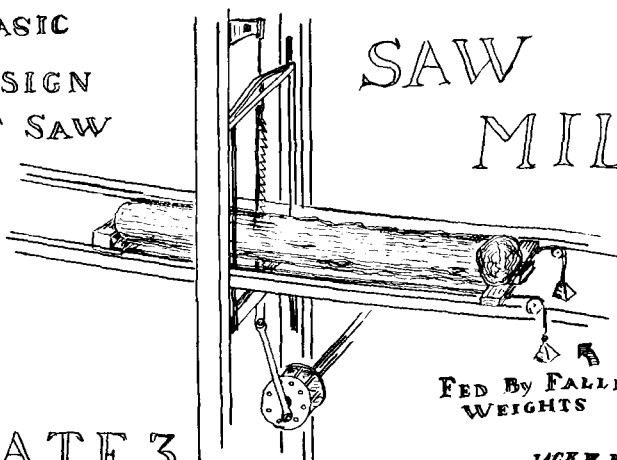


PRESS



STONE
CHASER

BASIC
DESIGN
OF SAW

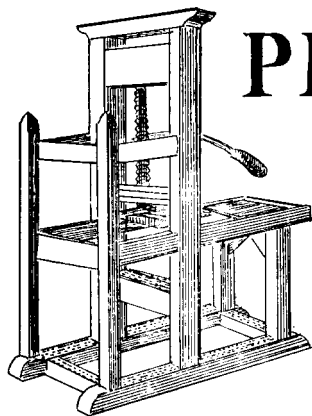


SAW
MILL

FED BY FALLING
WEIGHTS

PLATE 3

JACK W. W. LOOSE

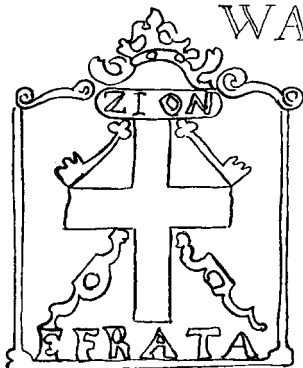


PRESS

1745



WATERMARKS



1745



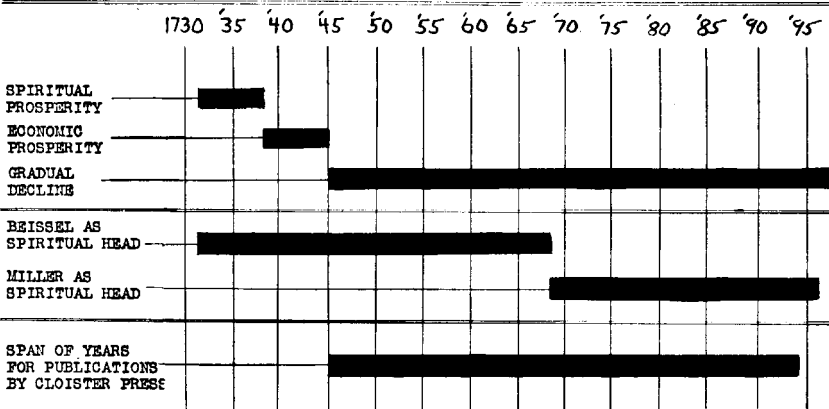
1744



1744



1746



GRAPHIC COMPARISON SHOWING DURATION OF MAIN ERAS AND FACTORS

PL. 4

JACK W. W. ROOSE