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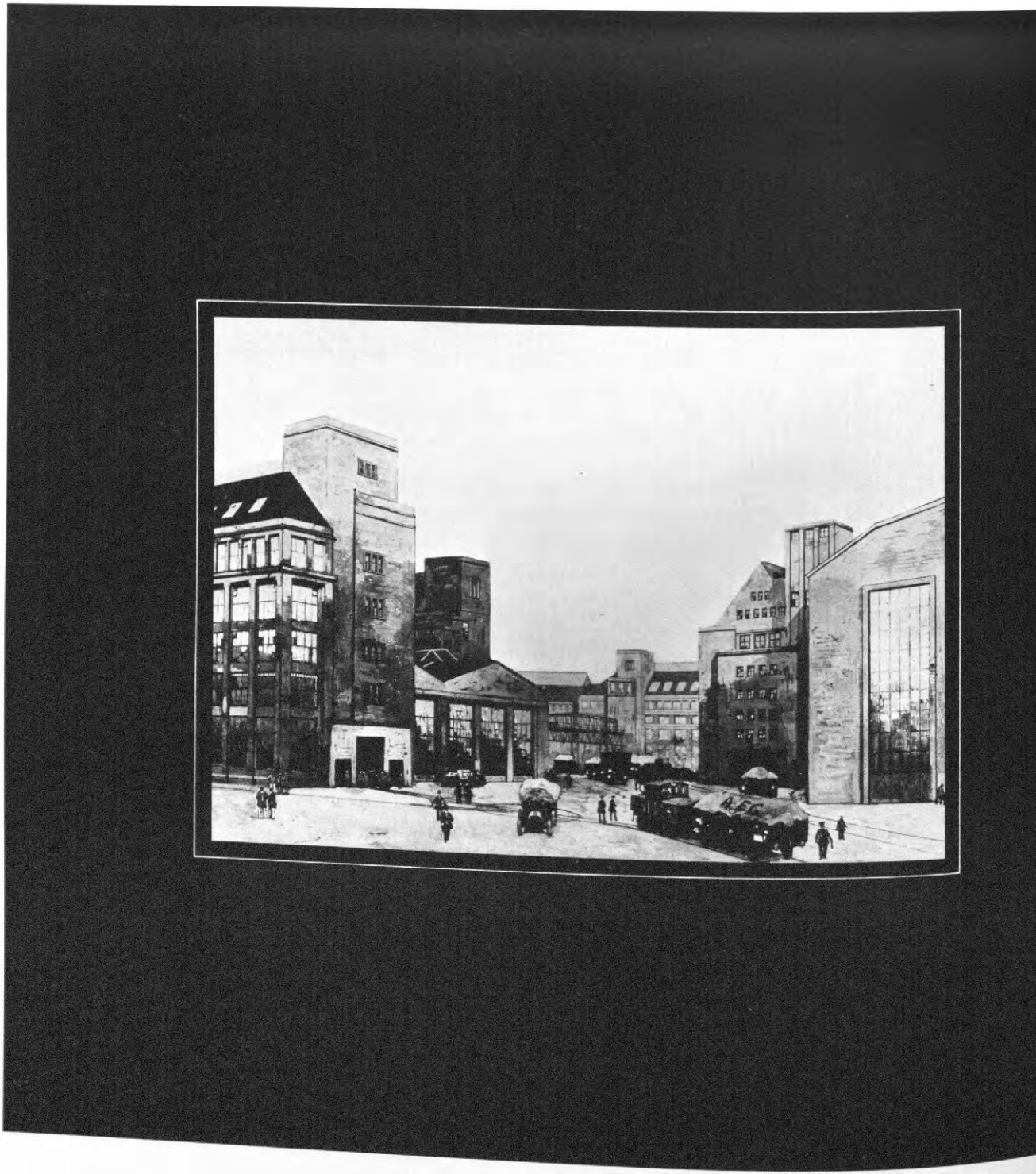
OPPOSITIONS

In this issue:

1 (frontispiece) AEG Humboldthain factory complex, Berlin. The High Tension Factory (completed 1910) and, at the right, the New Factory for Electric Railway Equipment and the Factory for Large Machines. Peter Behrens, 1911–1912.



Modern Architecture and Industry: Peter Behrens and the AEG Factories

Stanford Anderson

During his first years in Berlin, Peter Behrens projected the overtly Neoclassical house for Dr. Wiegand in Dahlem (fig. 3) and the equally classicizing and oppressively assertive German Embassy in St. Petersburg (fig. 7). At the same time he designed the AEG factories in Berlin (see figs. 15, 33) which eventually led Nikolaus Pevsner to extol Behrens as an innovator of "functional directness" in architecture. If such a claim cannot be fully sustained, there remains a remarkable difference in the manner and degree to which these two groups of buildings rely on historical precedent. This difference is all the more remarkable in that these structures seemingly marked two divergent routes from the highly abstract historical references of Behrens's Düsseldorf period. While at first glance it appears that Behrens adopted a more academic and conventional attitude toward his public and domestic buildings and a more independent and functional one toward his industrial work, it is the purpose of this paper to reveal basic commonalities in Behrens's work of these years.

Ludwig Mies van der Rohe offered a simple explanation for the apparent differences of these two groups of works. Mies argued that Behrens successfully concerned himself with a new expression for industrial buildings because this use-type was largely independent of any strongly held expectations on the part of the client, the public, or the architectural profession; on the other hand, Mies asserted, at that time no one could have conceived of a parallel formulation for significant public buildings.[1] One correct implication of Mies's observation is that Behrens shared the attitudes that in those years led even progressive architects to employ conventional solutions for such traditional problems as public edifices and private dwellings.[2] The conventions were perhaps innovatively explored, but there was a reliance on convention nonetheless. However, Behrens's factories are not anomalous in this setting. Within the greater latitude allowed to utilitarian structures, Behrens chose *not* to emphasize that "functional directness" which was already manifest in many engineer-designed factories (figs. 4–6); he rather sought to incorporate such works within an established but evolving political and architectural tradition. Behrens sought to bring the factory under the rubric of the embassy—not to bring the embassy under the rubric of the factory.

The stance adopted in Behrens's industrial architecture was a resigned acceptance of industrial civilization.[3] The industrial revolution had brought new patterns of organization, new personality types, new structural systems, and new materials and techniques of construction. These were rational extensions of earlier stages of human development and had, therefore, to be accepted as elements of a "new nature." For Behrens, the artist's role, as ever, was to exercise his will-to-form in shaping this new nature—the modern condition—into a true culture. He felt that there was a spirit and a rhythm to modern times which would find its true expression only through the artist.

In his Düsseldorf period, Behrens was concerned with a formal distinction between spatial definition and the occupation of space. The culmination of this concern was the exhibition hall at Mannheim, an abstract stereotomic space defined by immaterial planes and complemented by plastic sculptures (see *Oppositions*, 11, p. 55). However, such an abstract formulation provided little guidance in meeting the physical and material problems of building.

Behrens's first major architectural commission in Berlin, the Turbine Factory of 1909 for the AEG, forced him to recognize and accept certain material considerations. The very large dimensions of the factory, the rugged industrial operations which it housed, and its necessity for durability precluded the use of those ephemeral materials which had been both acceptable and appropriate in the earlier exhibition structures.

The Turbine Factory brought about a confrontation between the artist's stereotomic preferences and the tectonic character of the ferro-vitreous wide span frame. The resolution of this conflict was facilitated by a shift in German architectural theory from emphasis on material form to emphasis on space. Stated differently, the polarity of *Tektonik* and *Stereotomie* was subsumed within an understanding of architecture that emphasized space.[4]

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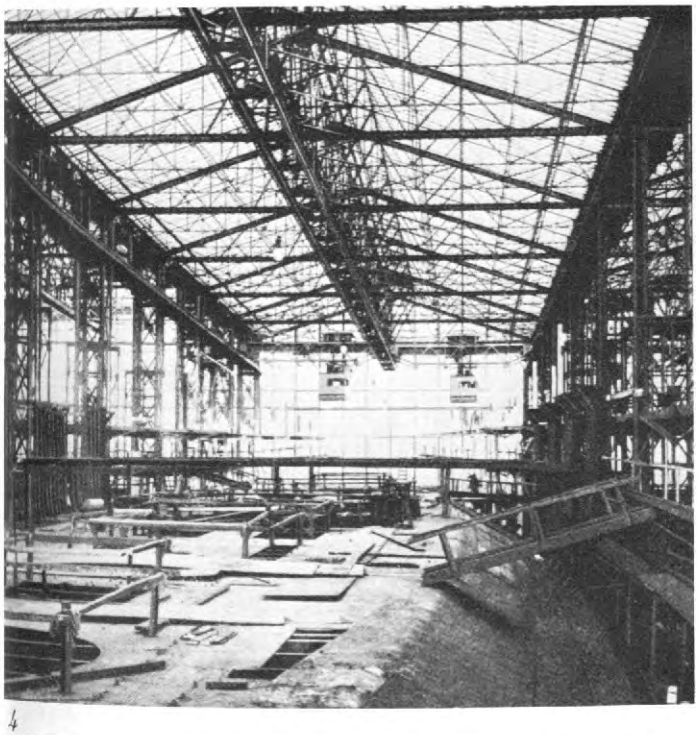
2 Gate to the AEG factories on the Humboldthain, Brunnenstrasse, Berlin. Franz Schwechten, 1896. The architectural sensibility of the corporation a decade before Peter Behrens was associated with the AEG.
3 Wiegand House (now the seat of the Deutsche Archeologisches Institut), Berlin-Dahlem. Peter Behrens, 1911–1912.



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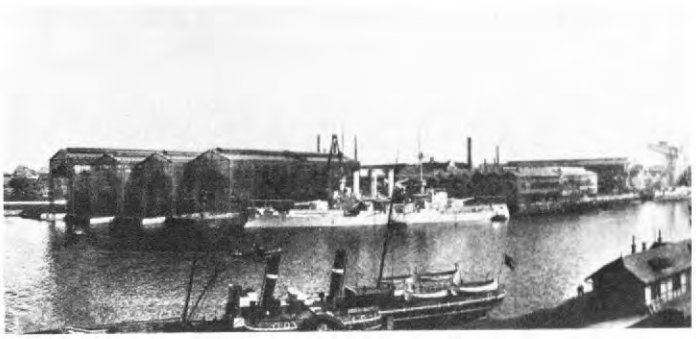

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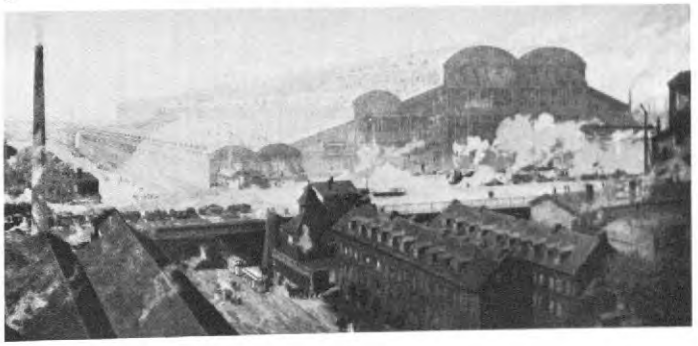

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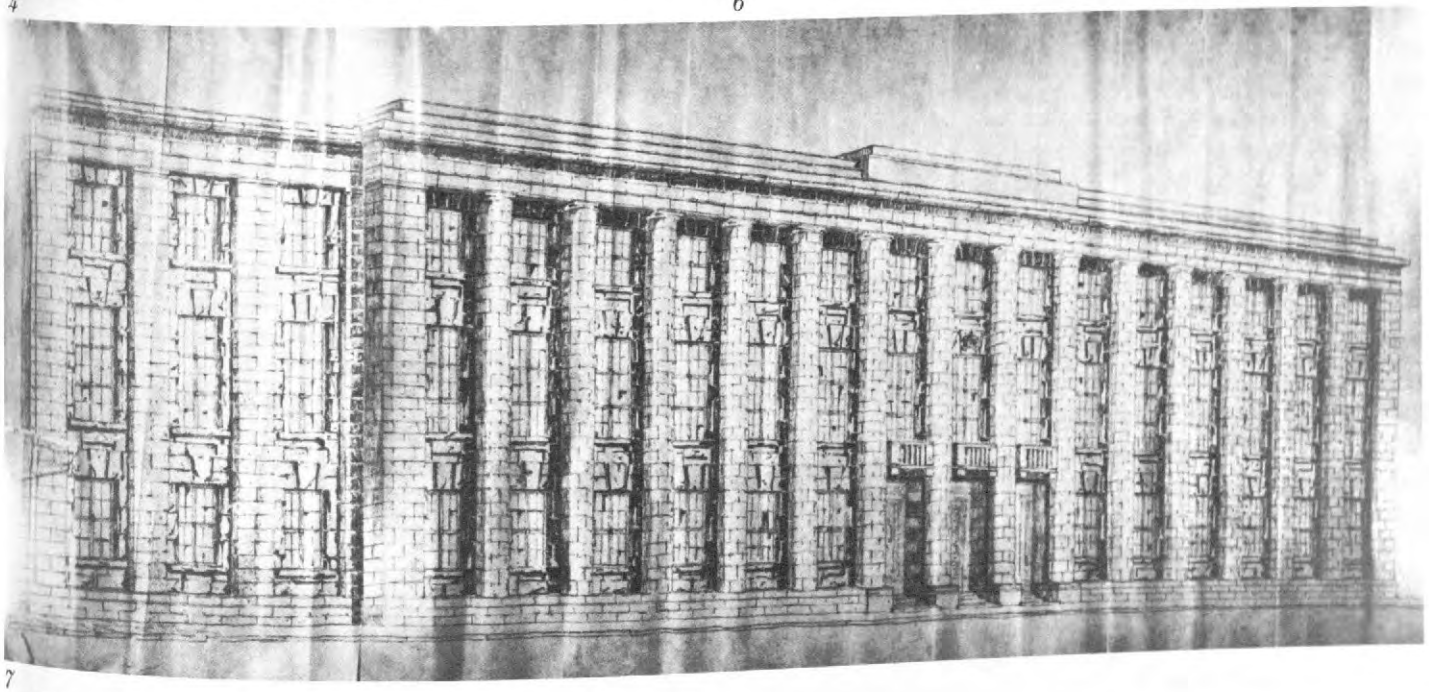

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4 *Friedrich Krupp AG, Germaniawerft, Kiel-Gaarden. Interior of the covered slip with deck of the battleship "Hessen."*
5 *Germaniawerft. General view, 1898–1902.*
6 *Friedrich Krupp AG, Ninth Machine Workshop, Essen, 1906ff.*
7 *German Embassy, St. Petersburg (now Leningrad). Peter Behrens, 1911–1912. Presentation drawing.*

56 Elaborating on Neoclassical theory, Gottfried Semper had contrasted the crystalline, mechanical wholes of *Stereotomie* to the organic, membered structures of *Tektonik*.[5] Coming from a different quarter Jacob Burckhardt accepted the idea of an organic architecture, but claimed that this could only result from a fortunate conjunction of naiveté and closeness to nature. Burckhardt postulated that this had happened only twice in history, arguing that there had been only two organic styles, each with its single grand type: the peripteral temple of the Greeks and the multi-aisled Gothic cathedral complete with its front towers. Any "diversion" from the tectonic norm of the great organic types would cause a tranformation into a spatial style (*ein Raumstyl*). "The late Roman style is already close to such a transformation, developing a significant spatial beauty which then lives on to varying degrees in the Byzantine, Romanesque, and Italo-Gothic styles—finally culminating in the Renaissance."[6] As the "diverted" types tend toward planar and cubic compositions, so the space, with an equally assertive cubic quality, comes to have an importance equal to that of the solids. Thus Burckhardt, by contrasting organic styles to spatial styles, honored the great tectonic prototypes but also implied that the organic, tectonic structures were emphatically corporeal and material.[7]

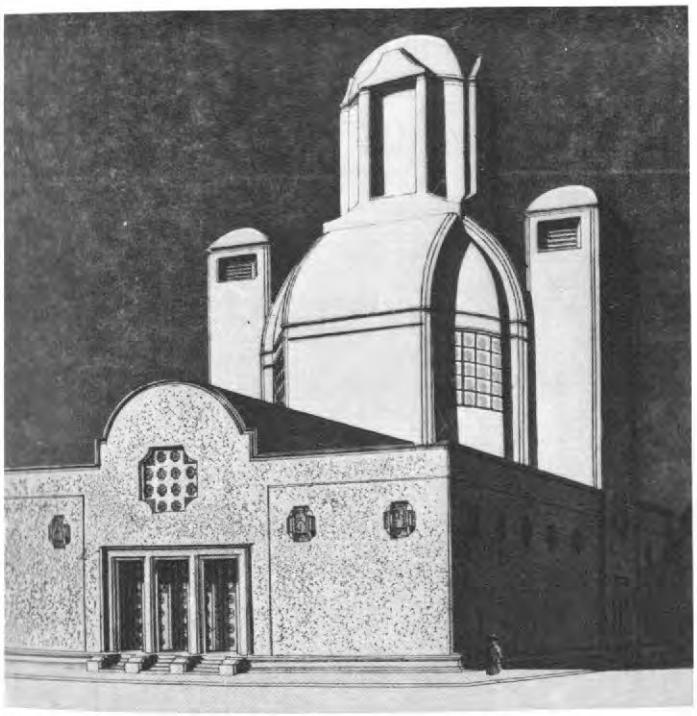
The shift in theoretical dominance from the tectonic conception of architecture to a spatial conception was fixed with August Schmarsow's inaugural lecture at Leipzig in 1896 in which he characterized architecture as, essentially, the forming of space (*Raumgestalterin*).[8] The apparent obviousness of this description compelled Schmarsow to engage in a polemic against established positions. He argued that contemporary architectural education, like Semper's theory, sought to construct the essence of a building style in terms of the orders, of the vaulting construction, or even from the crafts of the period. On the contrary, he suggested, an architectonic work is not achieved through the mere assembly of tectonic components. The emphasis must shift from material calculation and the *Formbildung* or *Ausgestaltung* of individual members, to a larger sense of the whole.

In architecture, Schmarsow continued, the f
space is the principle of style formation in all
felt that Wölfflin, relying on Semper, was c
wrong in saying that the birthplace of a new st
decoration. Decoration was merely the easies
introduce a new feeling for form. Wölfflin's de
architecture as the art of corporeal masses was a
in that it depended upon the material aspect o
ture. In this Wölfflin was echoing Burckhardt
vision of all styles into "organic" and "diverte
starting point in the corporeal realm. Fur
Schmarsow pointed out, even Semper had c
Gothic architecture to be merely constructive, n
in the sense assigned to Hellenic works.

Schmarsow felt that architecture understood as
mer-of-space" had several results. The *Tekton*
orders, admired by the Neoclassicists, was no
absolute norm; thus other styles could be more
preciated. The search for the spatial conception
in accord with what Schmarsow considered
genuine artistic truth, "The whole precedes th
Finally, Schmarsow suggested, the source of su
holistic spatial conception would be found in the i
energies of the culture.[9]

Behrens came to be indirectly influenced by Sch
themes of "painterly, optical" perception, holism
demic cultural energy, and Schmarsow's accep
generally depreciated styles. These same themes
us to another scholar by whom Behrens was m
enced—Alois Riegl.[10]

Although Schmarsow, Riegl, and Behrens were
away from the internal, "materialistic" criteria o
ory of *Tektonik* toward an understanding that c
itively incorporate both tectonic and non-tecto
tectural styles, they did not wish to advocate an
randomness. If the processes of artistic creat
lead to formal results that were polar opposites,
determining criteria must be external to the cre
cess. Here Riegl supplied the missing link bet
established concept of the *Zeitgeist* and specifi



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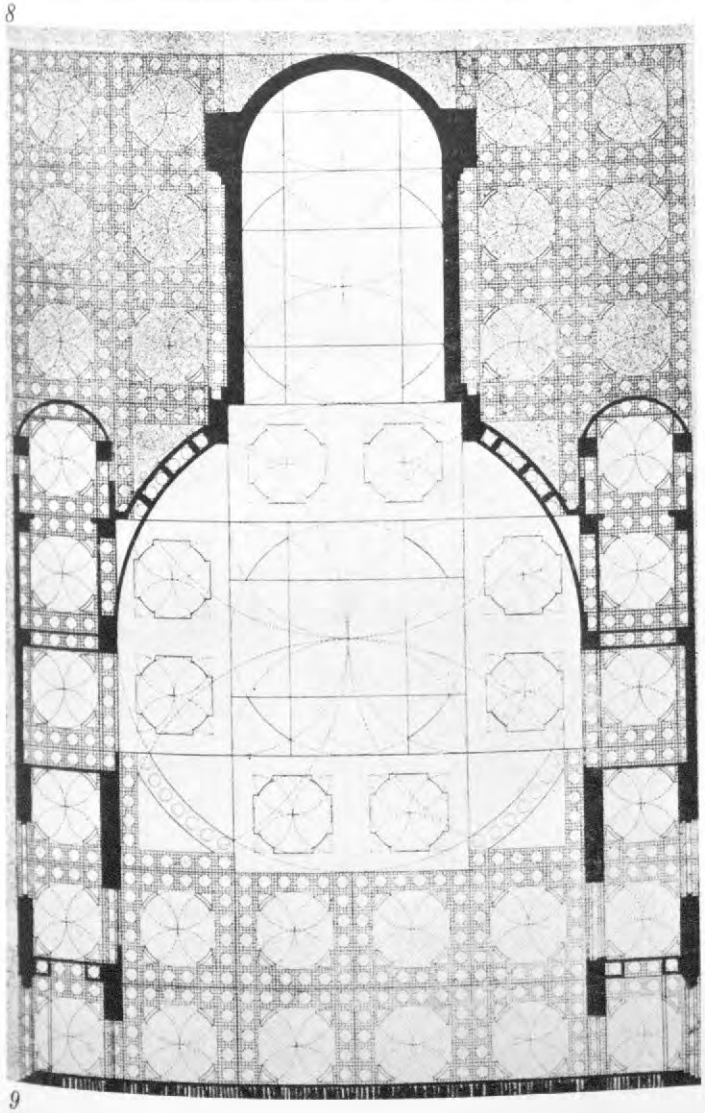

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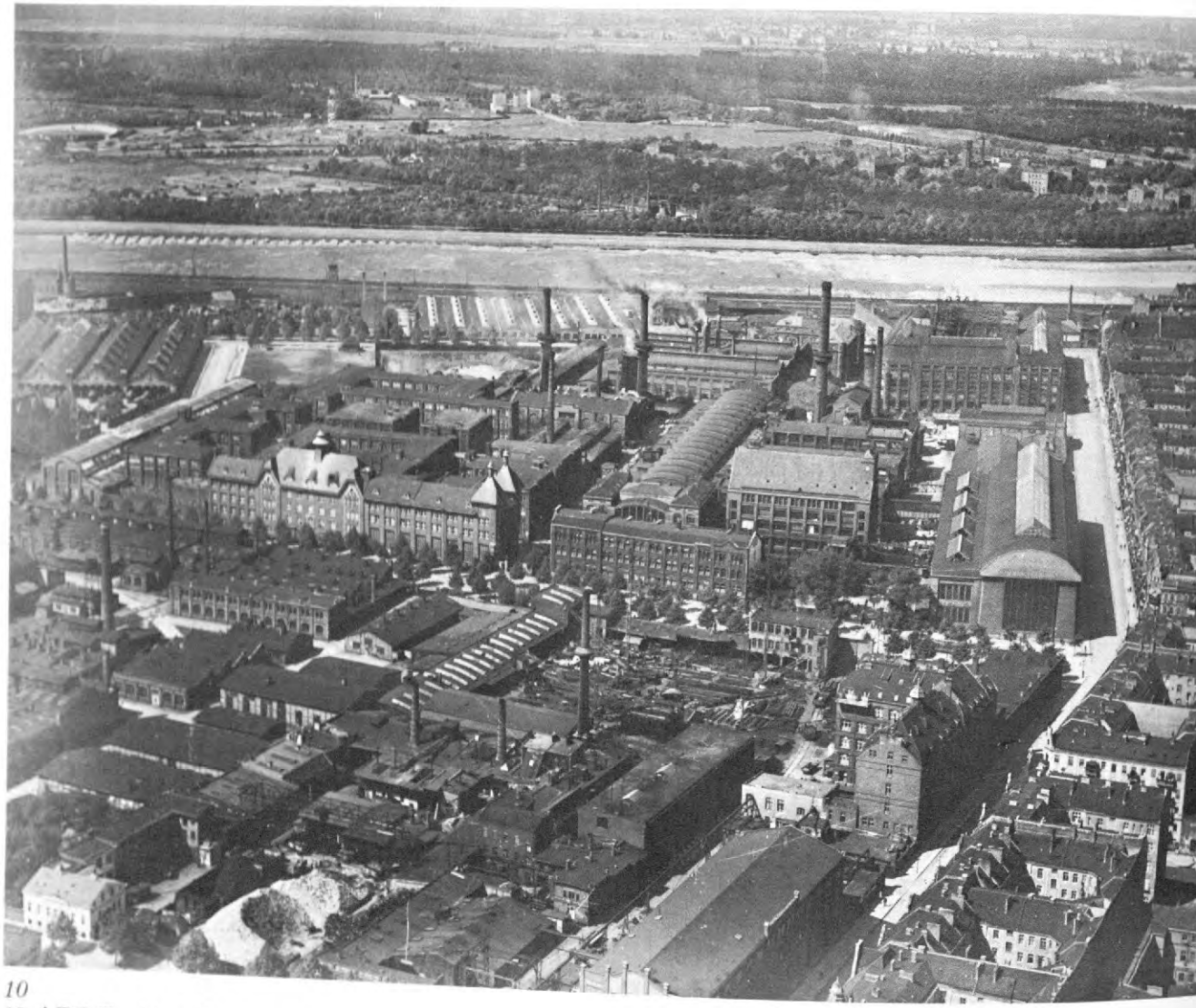
8 Project for a church. Christian Bayer, pub. 1909. Perspective. Designed according to a method advocated by J.L.M. Lauweriks in which the same differentiated grid underlay the plan, sections, and elevations.
9 Project for a church, section.

acts. This link he termed *Kunstwollen*—the will to art. At the first level, *Kunstwollen* accounted for the artist's control of the creative process *against* the practical dictates of the problem itself. However, to account for the determining criteria behind the unified style of a time, this apparently free will of the artist came to be associated with a collective, goal-oriented, motivating volition shared by the entire culture of which the artist was a part. For Behrens this meant an acceptance of the spirit of the times which he perceived to involve "an absolute clarification of spatial form to mathematical precision."[11] He regarded this as a metronomic, staccato pulse, as a form of reductionism implicit in the concept of *Sachlichkeit* which at that time was not yet confused with functionalism. There had also to be a recognition of the spirit of the people, of a *deutsche Volksgeist* of clarity and power. For Behrens the great imperative was that these collective, teleological wills be fulfilled—even in battle *against* function, material, and technique.[12]

It is largely due to his avoidance of total or continuous immersion in the industrial situation that Behrens's first works for the AEG (both in architecture and industrial design) were unprecedented in industry; his ideological dictates overcame gratuitous ornamentation and naive engineering functionalism while also undermining the more sophisticated functional theory of *Tektonik*. Behrens was the one to set this precedent in industry, but it must be admitted that there were other theoreticians and artists who also might have applied their version of the modern *Zeitgeist* to industry. Ideologically, Behrens is of a school that includes all those who were devoted to *Sachlichkeit* as a symbol of the times, to a cubic definition of space, and to a domination of the idea over the existential situation. Among those who were similarly committed one should include the more vigorous Viennese who were influenced by Otto Wagner; the more radical geometers among the Dutch, e.g., J. L. M. Lauweriks (figs. 8, 9); Hermann Muthesius in his insistence on conventional types; art theorists such as Alfred Lichtwark and J. A. Lux; and even political ideologists such as Friedrich Naumann.[13]



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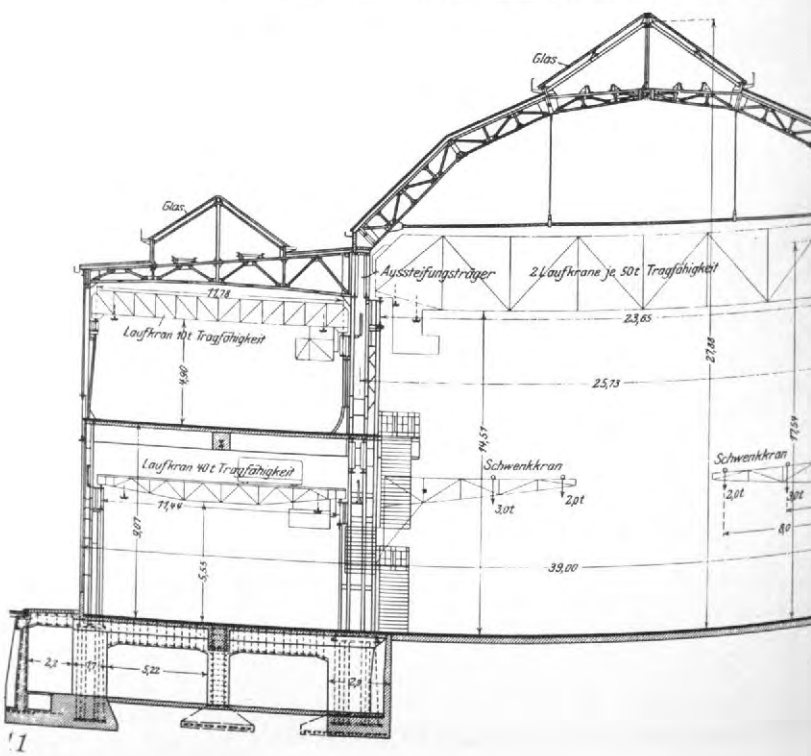
10 AEG Turbine Factory site, Berlin-Moabit. Peter Behrens with Karl Bernhard, 1908–1909. The "temple" facade of the Turbine Factory is at the right center.
11 AEG Turbine Factory. Transverse section.
12 AEG Turbine Factory. Plan.



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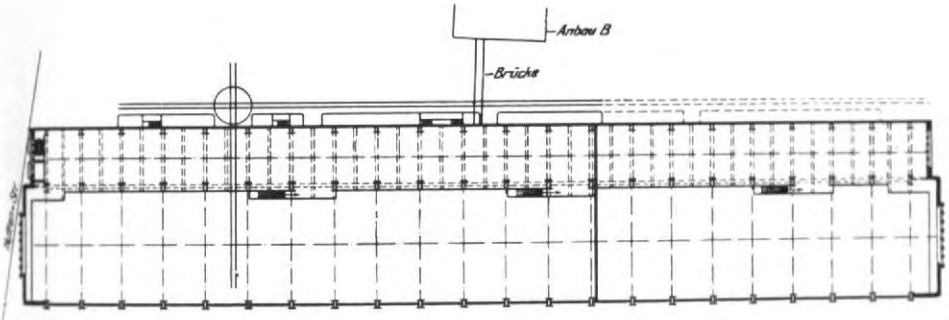

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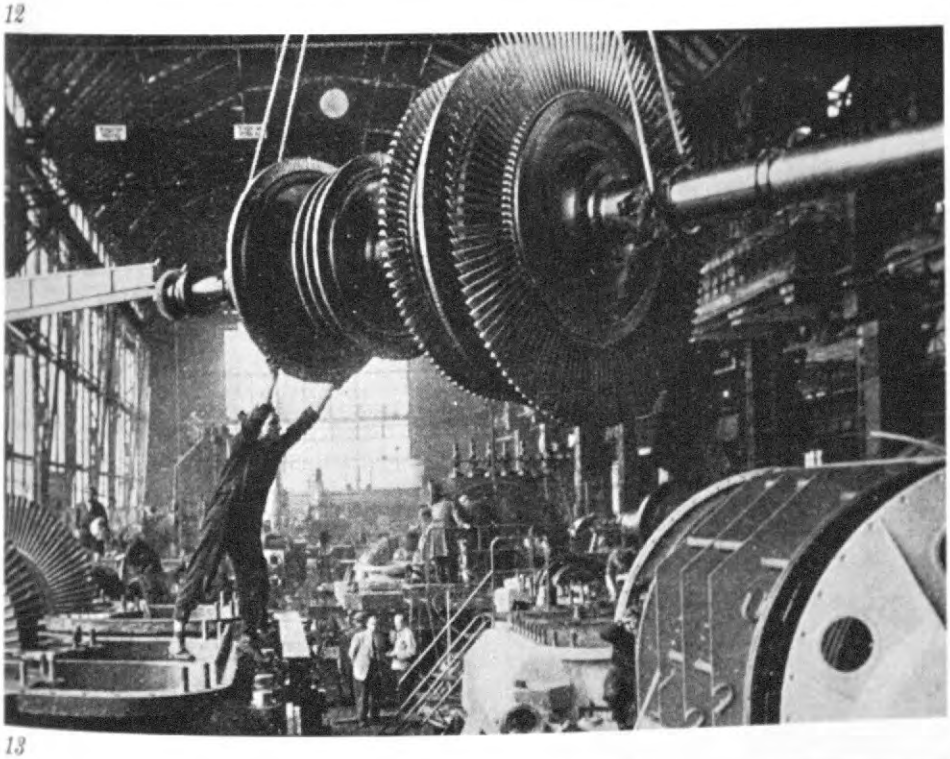

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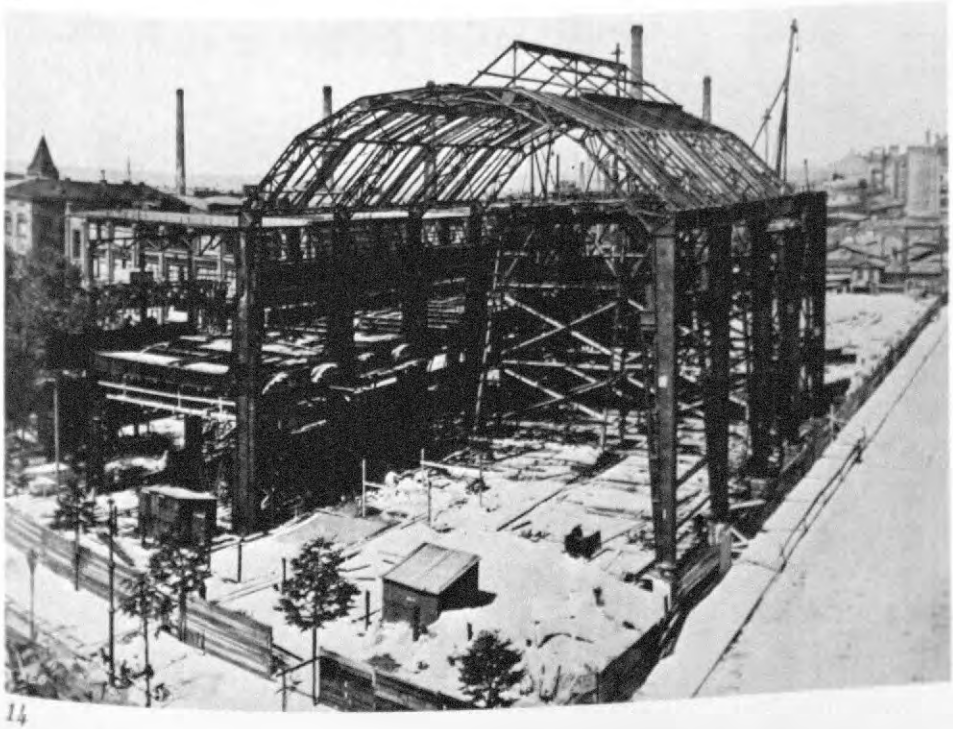

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13 AEG Turbine Factory. Interior.
14 AEG Turbine Factory. Under construction.
15 AEG Turbine Factory. The two street facades (Huttenstrasse and Berlichingenstrasse).
16 AEG Turbine Factory. Side to the factory complex.

17 AEG Turbine Factory, Berlin-Moabit. Hinge of arch, Berlichingenstrasse.
18 AEG Turbine Factory. Berlichingenstrasse side.
19 Tower and gable of the infirmary, Mittelschloss, Marienburg.
20 Cathedral and castle, Marienwerder.

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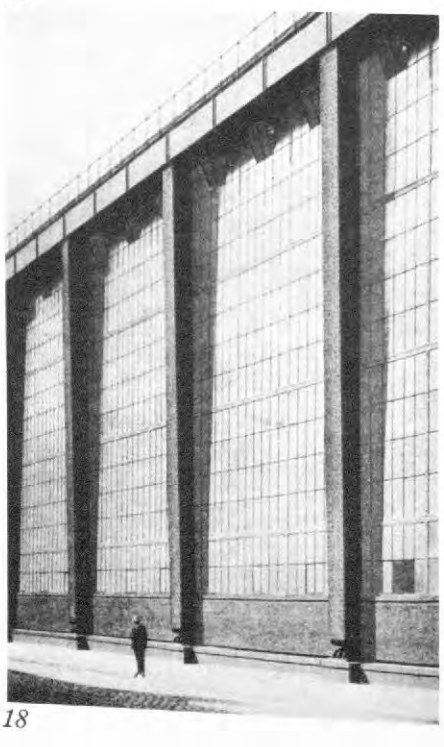

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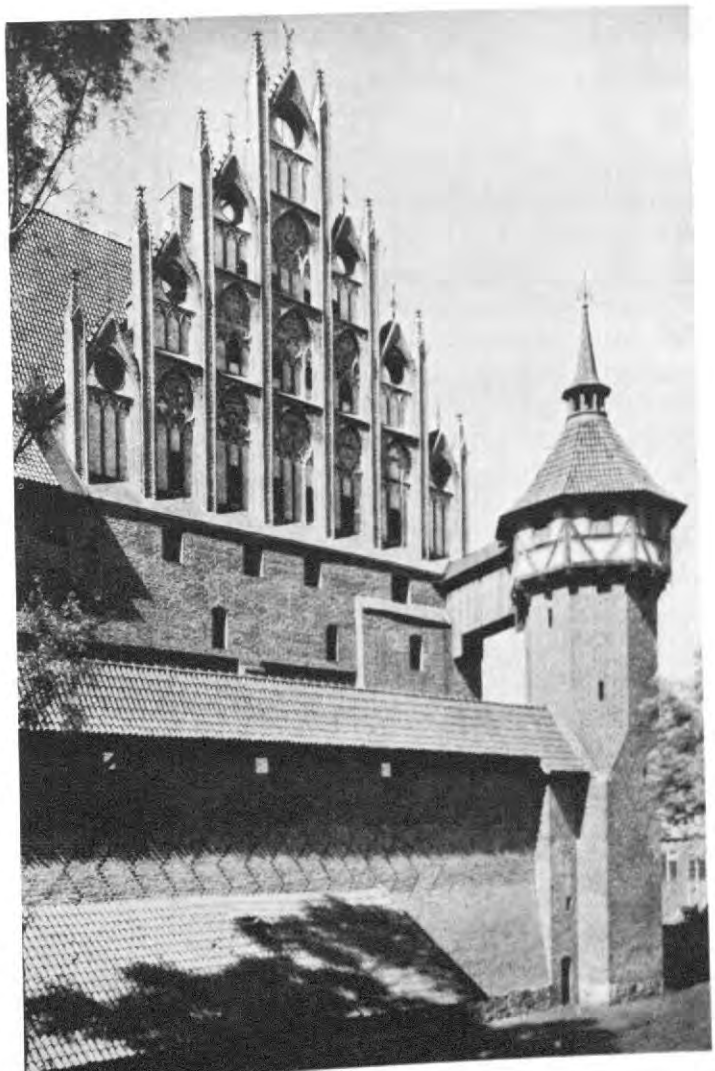
The most remarkable and well known examp
rens's *Kunstwollen*, of his "historicist" form-g
the AEG Turbine Factory (figs. 10–18). The p
dustrial circumstances surrounding this comm
quire some discussion.

The AEG, founded in 1883, was already a thr
poration by the early 1890s. In 1896, it began t
first extensive industrial site on a large terra
Humboldthain in northern Berlin (not far from i
factory in the Ackerstrasse). This was the comp
Behrens was to bring to completion before the f
War. The pre-Behrens factories on this site (th
which appears at the left of fig. 23) were n
buildings of conventional mixed brick and iron
tion employing modest amounts of medievali
ment. The most exuberant yet characteristic e
this first group was the polychromed and castel
gate which still stands at the northeast corner
facing onto the Brunnenstrasse (see fig. 2).[14] H
more general comparison between the old an
order may be seen in the Factory for Electri
Equipment (Fabrik für Bahnmaterial [see fig.
building had been undertaken in 1905 with ma
tailing derived from late medieval north Gerr
work. When Behrens arrived, the wing that a
the left of Figure 23 was complete, as was mo
wing which appears on the right, inclusive of
tural ironwork for the clock and water tower.
of the facade at right, and especially of the clo
reveals how Behrens, unlike his predecesso
achieve a broad and simple grandeur in his ow
tions from medieval prototypes, such as the Mar
and the Marienburg (figs. 19, 20).

Under General Electric patents for the Curtis s
bine and AEG's own patents acquired through
of Professors Riedler and Stumpf of the T
Hochschule, Berlin, the AEG was to start the
of turbines in 1902. After merging with the U
tricitätsgesellschaft in 1903, the AEG moved i
fabrication to the former Union factory site (s
a site of almost 88,000 square meters) in the M

trict of Berlin. There, housed in an existing 200 meter by 18 meter iron-framed, clerestory and sky-lit shed (near the center of fig. 10), the first AEG-Curtis turbine was produced in 1904.[16] The large-scale development and production of these turbines began about 1907, and soon after, the demand for more and larger turbine construction space had to be met. It was in response to this need that Peter Behrens was commissioned to design his first factory, the giant turbine fabrication hall which was to stand on the southeast corner of the Moabit factory site at Huttenstrasse and Berlichingenstrasse (see fig. 10, right center).[17] The factory was designed in 1908–1909; construction began in the spring of 1909 and the plant was in full operation at the beginning of 1910. Oscar Lasche, an engineer and the director of turbine fabrication for the AEG, specified the physical requirements for the new factory: full utilization of the available site, a main assembly hall having dimensions of approximately 80 by 400 feet (able to be extended to about 650 feet); two relatively fast traveling cranes capable of lifting almost 100 tons together and installed at such a height that the largest machine parts could be carried over machines on the assembly floor; radial cranes at regular points along both sides of the hall; the capability of bringing railroad cars directly into the work space; a smaller flanking construction to accommodate storage and secondary manufacturing operations (also equipped with traveling cranes); and the maximum amount of natural light consistent with the strength demanded in a building for such heavy and dynamic utilization.[18]

It is clear that Behrens, a man completely untrained in engineering and even lacking formal schooling in architecture, a man who had built only small buildings in the most traditional materials and then with a remarkable lack of sense for practical considerations, was ill-prepared for the technical problems of this new building program. There was an obvious need for the talents of an accomplished engineer, and consequently also the need for Behrens to come to terms with both new building materials and the problems of collaborative design. To this end, the respected engineer Karl Bernhard[19] became Behrens's collaborator on the Turbine Factory. However, despite



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62 Bernhard's expertise, Behrens used the engineer as an agent for his design rather than as a full collaborator, as we shall see.[20] Beyond the forcefulness of his own personality and his intimate connections with the directors of the AEG, the symbolic significance presumed for the Turbine Factory may have helped Behrens to achieve this control.

The Turbine Factory was meant to be symbolic in several senses. Elaborate significance was attached to the turbine and to the turbodynamo as impressive sources of modern power. One of the executives of the AEG later wrote that Behrens felt something of that which vibrates in the words of the poet Heinrich Lersch:
Maschinen rauschen in Heiligen Liedern, Fabriken sind gottliche Kirchen der Kraft.[21]
With a sense for turbines as the sources of power, the Turbine Factory would stand in a relation to other factories like a great abbey to its priories. The new hall was not only to be the most important building on the Moabit site, it was also to occupy the southeast corner of the site, oriented toward the center of Berlin, and thus would serve as the show-front of the entire factory complex. Executed in the way it was, this facade was to become *the* face that the AEG turned to the world, superseding the castellated gate on the Brunnenstrasse.

Behrens's design for the Turbine Factory called for a main assembly hall running for 207.38 meters along the Berlichingenstrasse, although a unit only 127 meters in length was built in the first phase (see fig. 12). Bernhard's structural design is most easily appreciated in the transverse section (see fig. 11). The basic structure of the main hall is an asymmetrical three-hinged arch with a tie-rod. The impressive mechanical detail above the reinforced concrete foundation along the Berlichingenstrasse (see figs. 17, 18) is one of the hinges. From this hinge the first, and longer, member of the asymmetrical arch ascends vertically and then arcs, in three facets, into the central hinge at the apex of the main structure (see figs. 11, 14). The other, shorter member springs from the highest point of the structure shared by the main and side halls. The tie-rod is attached just above this point; the span is 25.73 meters; a large, continuous skylight about nine above the floor crowns the entire constructio shorter member of the arch and the corresponding the longer member have box-like open lattice-wor sections, while the vertical segment of the long has a plated box section. Attached to the interio vertical segment is a lattice-work member which s one of the traveling crane tracks which run imm below the tie-rods. The clearance below the cranes meters; their clear span, 23.64 meters. The asym arches occur at 9.22 meter centers along the lengt building, with continuous glazing between; at eve arch is located a radial crane cantilevering eight (2000 kilograms capacity at full reach). The side cluded a basement in reinforced concrete and a tw superstructure of mixed construction.[22] The struc not only to incorporate large glazed areas for the p of light to the working surface but also to resist th involved in braking heavily loaded cranes movin rate of two meters per second.[23] This accountin main physical aspects of the building evokes the the problem and the technology that was employe ever, as we have come to expect with Behre technical matters were only means to more a ends.

Behrens was anxious to correlate a number of concerns. The practical needs outlined by Oscar dictated a gargantuan scale[24] and a ferrous s much influenced by these magnitudes. Behrens wanted to express the quality, scale, and cultura cance of this "new nature," convinced that suc pression required the formulation of a symbolic s outside the province of the engineer. He sough his architecture a corporeality which it previous but which he now, like most architects bef thought was necessary even in the housing of a ta tural cage. And he desired to be the prophet classicism destined to reinterpret the energies o porary life in terms of the eternal verities.

This search for corporeality and classical expres a distinctive point in Behrens's development.

bolic expression of a "new nature" constituted the challenge to his new position. Less important, but not to be ignored, was the fact that this orchestration was to be played out in Berlin, where Behrens admired but also aimed to rival the work of Germany's most famous Neoclassical architects, Carl Friedrich Schinkel and Friedrich Gilly.

In a statement made by Behrens at the time of the completion of the Turbine Factory,[25] several of these concerns can be noted. Behrens stated that the architectonic concept behind the main body of the building was to draw the construction together into an emphatic mass of iron rather than to allow the iron framing to dematerialize into a dispersed network.[26] This hall should have an enclosed, planar definition emphasizing the architectonic proportions of its space. The principal vertical members were detailed with solid-web walls in order to give them mass, emphasizing their dual roles as both structural supports and as space-definers. The massiveness of these members was all the more important since the building was to be constructed, so far as possible, of iron and glass. Where Behrens felt that these materials were architecturally inadequate, carefully executed concrete walls were to be used. Behrens maintained an understandable but highly problematic conception of concrete as a plastic material that could easily assume any form desired. In the Turbine Factory, he sought to use concrete as an infill material that would not possess the load-bearing appearance of masonry. Only the iron members were meant to suggest a supporting function; the windows of the side elevation were inclined along the inner face of the structural members, allowing those members and the beam at the cornice line to stand in strong relief. This entablature-like beam and the gable of the front elevation were to establish, according to Behrens, a corporeality, a body resting on the principal members of the side elevation and on the structural mullions of the window at the front. The iron bands set in the rounded concrete corner elements made horizontal lines which, Behrens felt, provided a distinction between the structural verticals and the more plastic infill. The mullions and glass of the end window were detailed as one large plane in order to suggest its bearing function: all mullions of the same size, the glass in the front plane of these members, and the whole in the plane of the gable.

At the two-story side hall (see figs. 15, 16) the street elevation and four meters of the long side elevation were rendered in concrete so as to accent, according to Behrens, the totally iron and glass construction of the side wall. However, since iron and glass lack the volumetric quality of stone, the concrete end walls of both the halls were needed to tie the composition together and ensure its desired massiveness. Thus though the engineer's calculations ensured unity and stability, the eye was seen as requiring its own cues. At the same time, Behrens eschewed sculptural and ornamental decoration as being inappropriate to a factory and inimical to the goal of corporeality.

Behrens could hardly have been more specific about his rejection of normal factory construction in iron and glass; nor could he have been more frank about his endeavor to bring these materials into what he saw as the elevated tradition of architecture. In the side elevation on the Berlichingenstrasse (see fig. 18), Behrens and Bernhard succeeded in fulfilling the architect's aims with a minimum of technological compromise: the large scale, the industrial materials, the machine-like details are technically appropriate, but also achieve an intensified character. Set on a high pedestal, the hinge (see fig. 17) becomes a reference to the more complex engines within. These bases, the solid, boldly revealed uprights, the concealment of the diagonal bracing, and the shadow cast by the trabeation establish a machine classicism rich in corporeality, in nuance of detail, and in levels of evocative meaning. By the testimony of Bernhard, the simple iron and glass elevation on the Turbine Factory toward the rear yard (see fig. 16) was very different from that on the Berlichingenstrasse (see fig. 18). Of course, there are differences inherent in the operation of the two parts of the building itself: two small stories as against one large; an active face toward the factory complex in contrast to an inactive face lining the street. Beyond these contextual differences there were also fundamental differences in the design process.

21 Siemens-Schuckert-Werke, Metallwerk, Berlin-Siemensstadt. Hans Hertlein, 1917.
22 Project for a city gate. Friedrich Gilly, c.1800.

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Bernhard actually thanked Behrens for accepting courtyard side, what the engineer took to be th result of pragmatic considerations.[27]

Bernhard juxtaposed this mildly ironic gratitud criticism of Behrens's artistic control of the Hutte elevation, which needed to be no more than a clo a series of arches, logically related to the cross-s given by the structural members (compare figs. Asymmetries in the function of the building an urban situation led to the use of asymmetric arch were then concealed by the symmetries of the strasse facade. Similarly, the two stories of win the Huttenstrasse facade of the lesser side hall r irregular conditions of a stairwell and an elevat In both cases, form and fact are in conflict and t ward juncture of the side hall against the incline gives some indication of how independently form ceived with respect to function.

Something similar can be said of the gable fro Reyner Banham regarded as displaying the trad acceptable formalism of Behrens. Surprised that did not hold to a normal triangular pediment, offered a technological explanation of the polygon form: the need to gain clearance for the traveling However, as the section (see fig. 11) indicates, rods forced the cranes to run well below the ext created by the unusual roof form. Structurally, t ning portion of the three-hinged arch could have in a straight line from its springing to the crown. ing to Bernhard it was Behrens's decision about th that predetermined Bernhard's attitude toward t In this case, ideas concerning form and symbol tated the physical solution.[29]

Behrens wanted the roof in particular to estab corporeality of the Turbine Factory.[30] Only by cr heavy gable, which is not in any way implicit in th metrical arch and tie-rod, could Behrens give the desired weightiness. Behrens's image of the build whole, and his desire for a corporate display-fac quired him to move out of the plan of the last

establish a new structural system for the facade. The concrete gable, with Behrens's hexagonal signet for the AEG, is borne by an iron truss, the top chord of which coincides with the profile of the arches beyond. This truss had to be supported, and Behrens thus provided his showfront with bearing members which were not just stabilizing mullions or the infill of a plane below a structural arch.

A strange phenomenon may be observed in the completed building. Behrens considered the concrete corners to be infill detailed in such a way as not to compete with the iron structure.[31] Concrete was a rather odd choice for this purpose, but in fact Behrens was creating a building without structural support at the corners—a kind of corner window rendered in concrete! The implication of this would seem to be that he was creating independent facades which required rather neutral transitions from one to another. The structureless corner was the unexpected and even unexploited consequence of other decisions.[32]

Thus for Behrens the Turbine Factory was clearly a compound of metal supports and concrete infill. Bernhard, on the other hand, was displeased that concrete was used so freely in the Huttenstrasse facade and found it only natural that people interpreted the Turbine Factory as two massive corner piers with a high pediment—or that Oberbaurat Erhard of Vienna misclassified the building as one of reinforced concrete construction.[33] However, the alternative readings of the Turbine Factory are too obvious to encourage the belief that Behrens was unaware of the ambiguities he had established. The unusually weighty, and even classical, character explicitly intended by Behrens in this iron-framed building delighted many contemporaries because it brought this type of utilitarian construction into the architectural tradition.

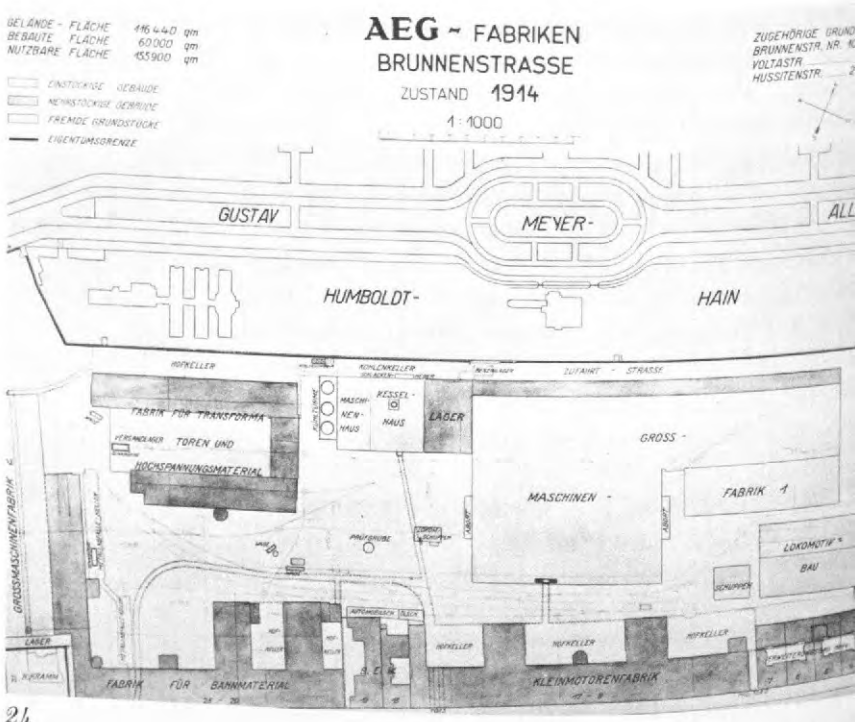
However, a comparison of the Turbine Factory with a Neoclassical portal by Friedrich Gilly (fig. 22)[34] yields some notable contrasts. The flanking pylons, the overhanging masses above, and the central void are similarities of the two designs. Yet Gilly was consistent at both a traditional and utilitarian level: solids support or span; voids serve for passage. In the Turbine Factory, the central void did not serve for passage; indeed, its unemphatic framework was simply the support for the overhanging mass. The factory-temple had no corner columns; the most massive elements of the building, the pylons, were to be read as mere infill. The inherent ambiguities of the factory and its inversion of classical form are consistent with Behrens's will to mark his resigned endorsement of industrial civilization.

Any appraisal of the Turbine Factory as Germany's first monumental iron and glass building[35] may be refuted by citing such precedents as August von Voit's Munich Crystal Palace (Glaspalast, 1854), or the more monumental great circular hall by Friedrich von Thiersch in Frankfurt (Fest- und Ausstellungshalle, 1907–1908), and a number of railway stations, including the very impressive structure built in Hamburg by the architects Reinhardt and Süssenguth and the engineer Medling (1903–1906).[36] If one chooses to see the Turbine Factory as the "first piece of modern architecture" because it makes "logical use of modern materials such as steel and glass" and "solves a typically modern industrial problem,"[37] or as "frank industrial architecture,"[38] then one is failing to take note of another factory that is even more frank, more logical, of grander scale, and which integrates within it an impressive differentiation of transport systems: namely, the thirty-one meter wide Krupp Ninth Machine Shop in Essen, which is a strictly iron framed building with glass and brick infill (see fig. 6).[39] Another example of impressive iron and glass factory buildings could be the completely glass-covered slips of the shipyard Friedrich Krupp AG Germaniawerft at Kiel-Gaarden (see figs. 4, 5), built in the years 1898–1902.[40]

These Krupp factories serve as precedents for an industrial architecture developed within the conditions of site, use, process, and construction.[41] These factories were light and spacious, and free of historical reference.[42] On the other hand, it was Behrens's intention to express the essence of powerful contemporary collective institutions. Beyond mere utility, Behrens sought to create the monuments of a culture based on modern industrial power—both physical and corporate power. Behrens's success in

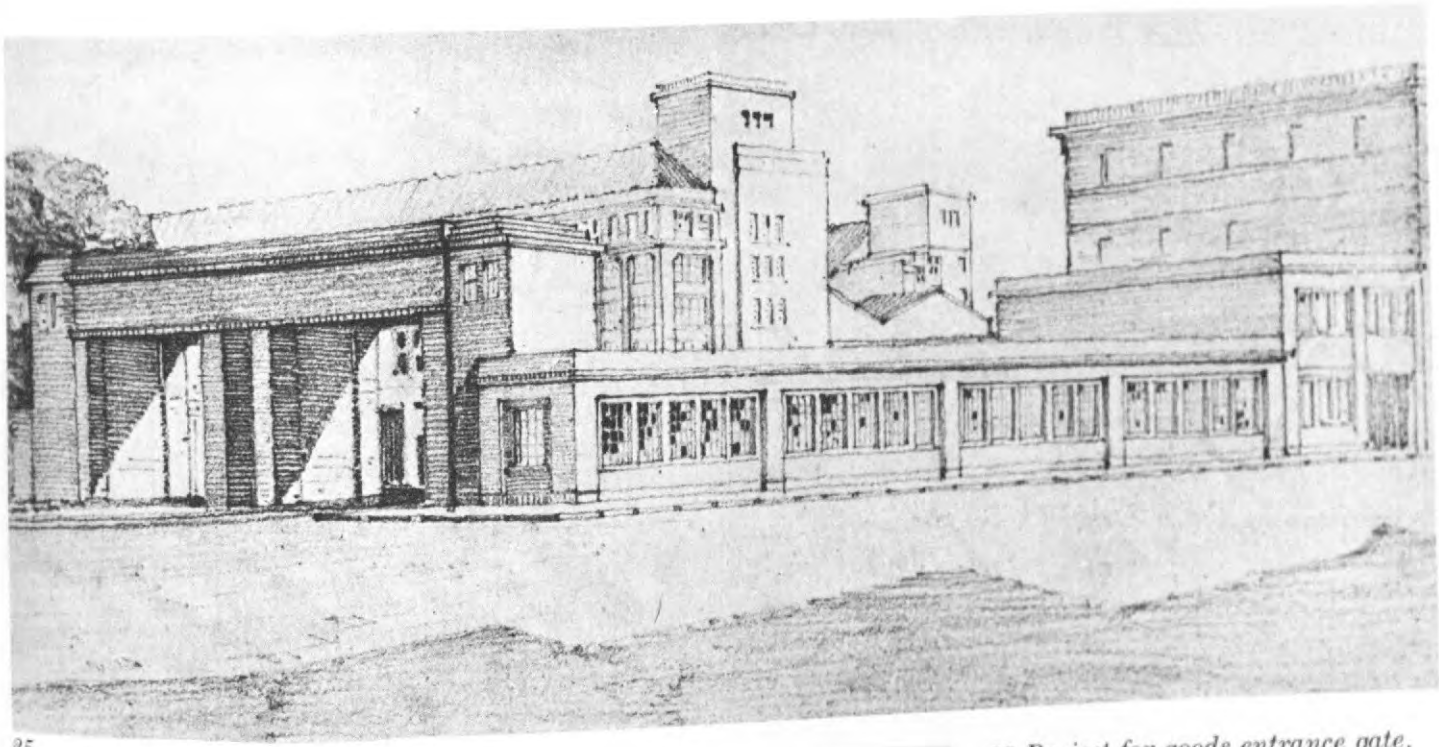
23

23 Old section of the AEG Fabrik für Bahnmaterial, Berlin. Johann Kraaz, 1904–1907. Factory yard side. The stair, clock, and water tower—and the simplified detailing of the wing at right—are by Peter Behrens, 1908.



24

24 AEG Humboldthain factory site, Brunnenstrasse, Berlin. Development as of 1914; factories by Behrens are the High Tension Factory (upper left, compl. 1910), the Small Motors Factory (bottom center, 1910–1913), and the western part of the Factory for Electric Railway Equipment and the Factory for Large Machines (lower left, both 1911–1912). The latter factory was shortly extended through the corner site to the Voltastrasse.



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26

25 Project for goods entrance gate, AEG Humboldthain factory site, Berlin. Peter Behrens, 1910–1911. Unexecuted design. High Tension Factory in background.
26 Goods entrance gate, AEG Humboldthain factory site, Berlin. Peter Behrens, 1912. Factory for Large Machines at right.

68

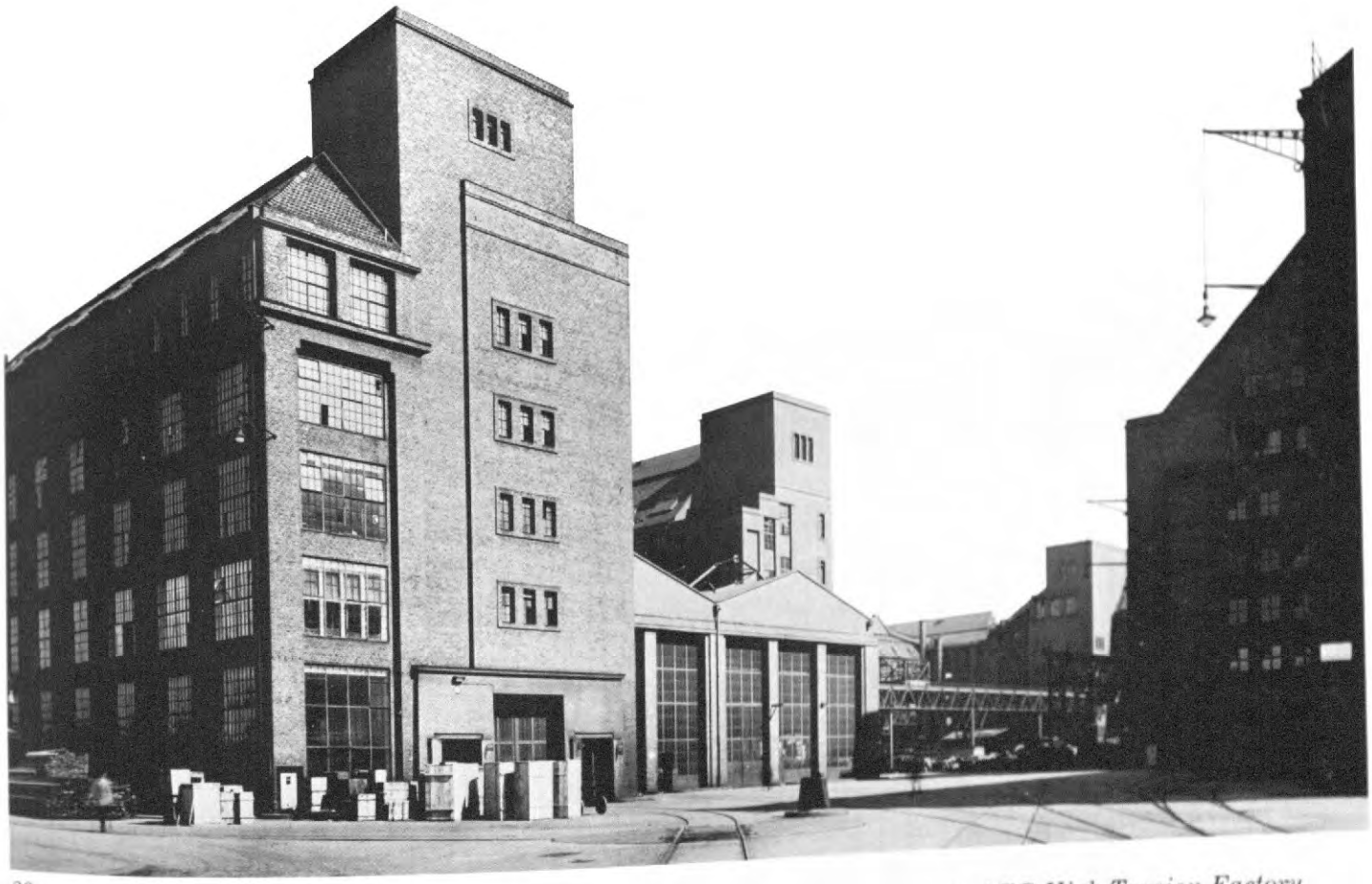
27

this program made his Turbine Factory unprece

As has been stated, from the time of its compl
Turbine Factory was recognized as a significant
ing work in the field of modern architecture. H
review of Behrens's subsequent industrial wor
interpolations and variations that produced quite
results. The principal site of these later building
117,628 square meter AEG Humboldthain co
northern Berlin (figs. 23, 24). Within this comple
factories existed before Behrens's arrival. Th
concentrated in the central and northern part o
separated from the street by a group of residen
ings. The administrative approach to this com
marked by the castellated gate on the Brunn
(see fig. 2), appearing at the upper right corner
plan.[44] The railroad and freight approach (at t
left corner of the plan) ran parallel to the Hussite
across the Gustav-Meyer-Allee and into the site
west. Behrens proposed but never carried out
and service building at this point (fig. 25).[45] Th
ratively simple gates and lodges that were late
Behrens's design appear in Figure 26. The tota
namented simple cubic forms of emphatically
hard bluish-red (*Eisenklinker*) brick, charact
many of Behrens's designs, provided a very dif
troduction to the factory site than the castellate
the Brunnenstrasse.

The rail lines continue eastward into the large y
is the physical and organizational center of th
complex. To the north is the first factory built to
design on this site, the High Tension Factory (H
nungsfabrik, completed 1910, figs. 24, 28).[46] Onl
later came Behrens's Small Motors Factory faci
east on the Voltastrasse (Kleinmotorenfabrik,
see fig. 33).[47]

In contrast to the Turbine Factory, the High
Factory, an assembly plant for transformers a
equipment for high voltage transmission (figs
presents an irregular silhouette. It consists of int
blocks which make asymmetrical concessions t



28

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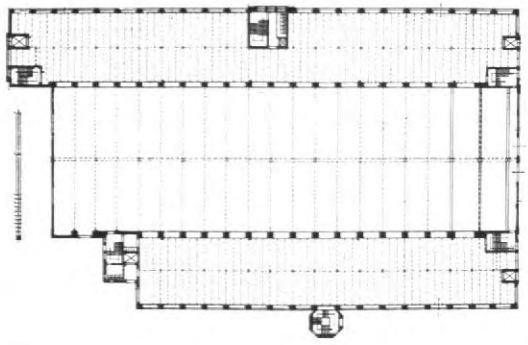
27 AEG High Tension Factory, Berlin. Peter Behrens, compl. 1910. East face.
28 AEG Humboldthain factory complex viewed from the goods entrance at the northwest, off the Gustav-Meyer-Allee, Berlin. The High Tension Factory is at the left.
29 AEG High Tension Factory. Viewed from the southeast.



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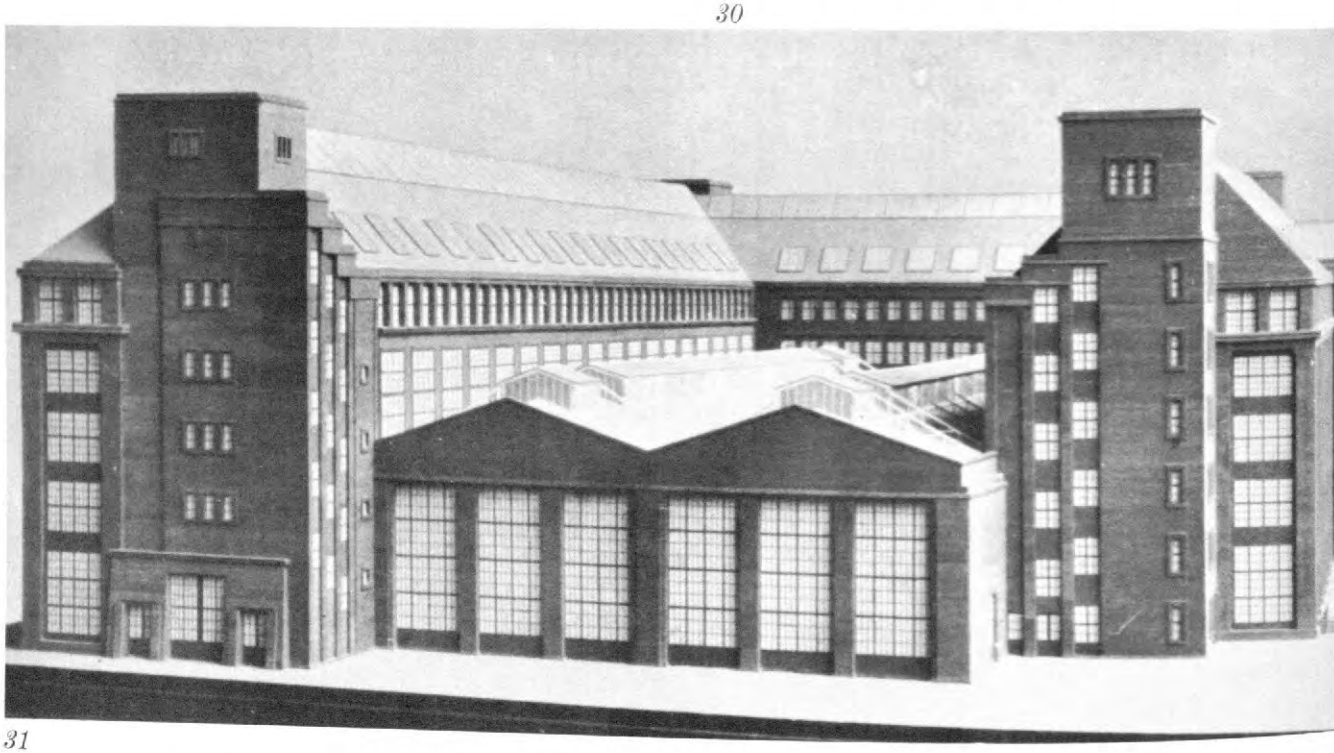
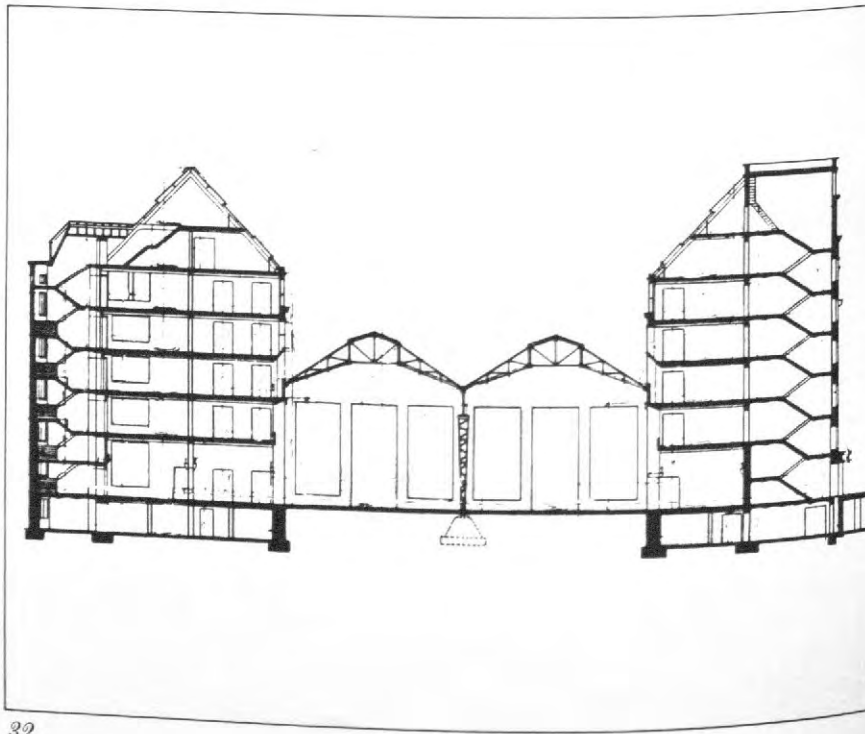


31

30 AEG High Tension Factory, Berlin. Plan.
31 AEG High Tension Factory. Model, viewed from the southwest.
32 AEG High Tension Factory. Transverse section.



32

(see fig. 31). The entire surface is clad in brick and tile.[48] The central part of the complex consists of two large, ferro-vitreous skylit halls thirty-five meters in width, seventeen meters high and just over one hundred meters in length (figs. 30–32). This double hall is flanked by basement services with locker rooms and multi-story working areas which comprise, in ascending order, a six-meter-high storage and assembly floor at the main level, four four-meter-high work floors, and two more work floors under the roof. At the eastern end (fig. 29), two regular stories plus a mansard story literally bridge the wide-span halls below.

At both east and west ends the main halls terminate in greatly simplified temple fronts in hard steel-blue *Eisenklinker* bricks. However, by far the strongest impression is made by the multi-storied parts with their repetitive bays and prominent access towers. Continuously open horizontal runs for the assembly lines were attained by the placement of these towers at the ends or outside the main envelope of the building (or, subject to the site constraint on the north, in a position that preserved as much of the horizontal continuity as possible). The repetitive bays of the first four floors (see fig. 29) are slightly recessed within a flat brick colonnade; the entire fifth floor serves as an entablature for this colonnade. The doubled mullions[49] give the effect of a frieze. The more emphatic cornice being below rather than above this "frieze," it establishes an ambiguous continuity with the roof rather than with the colonnade—an intentional rupture in classical syntax. In the stair towers (see figs. 27, 28), Behrens delighted in working with a broken silhouette, irregular openings for various purposes, and stepped windows for the stair runs.[50]

The picturesque projections of this factory, its irregular western termination in accordance with movement patterns, its overall plan around interlocking courtyards—all these characteristics are reminiscent of the ideas of another architect who fused medieval and academic sensibilities, Camillo Sitte.[51] Speaking of the Humboldthain courtyard, Behrens acknowledged his debt to Sitte:

"Now as to the placement of buildings! In this the process of manufacture is paramount. The disposition of trackage will govern building location. By stepping back the buildings, portals and driveways are well accommodated; at the same time liberal loading courts must be provided and thus contact is made with an outstanding principle of city planning. Because of the practical necessity of recession, the group acquires an effective silhouette, and due to the necessary arrangement of courts, a requirement of that old master of city planning, Camillo Sitte, is complied with. Sitte pronounces plazas enclosed by building units one of the most essential elements in creating artistic effects in city planning. It is only necessary to have had the opportunity for comparison between layouts directed from a purely practical viewpoint by an understanding mind, and those created by chance or time's accretions, granted an equal expenditure in money and equivalent materials, to find an astounding difference in the impression created."[52]

It is characteristic of Behrens that he addressed himself to the understanding mind as well as to practical necessities. For Behrens, this mind worked one way when presenting a street-oriented monument like the Turbine Factory and completely otherwise when creating a factory courtyard interlaced and surrounded by practical operations.

Behrens's ability to embrace these various conditions was demonstrated in a single building, the Small Motors Factory of 1910–1913,[53] across the courtyard from the High Tension Factory. The courtyard side of this later work (figs. 33, 34) is articulated by lateral projections and loading courts. The dimensions, the materials, and the detailing are all similar to the High Tension Factory, although a somewhat different inflection is evident in the placement of a stair behind the windows (fig. 34). The repression of an access element within the whole permitted the simple termination of this wing with a strong triangular pediment. This return to the sovereignty of the whole over the parts is emphatic on the opposite, Voltastrasse elevation (fig. 33).

The stance of the Small Motors Factory relative to the

72

33

street is significantly different from that of the
Factory. The Voltastrasse plant was part of a l
on a secondary street, not a corner building at a
point of arrival. The operations housed did not
spaces of unusual size. This fact, together with t
for relatively intense utilization of this site, enc
the construction of a multi-story factory (see figs.
On the other hand, like the Turbine Factory, th
Motors Factory presented a closed and classicizi
to the street; there a frame forming a temple fro
a wall architecture providing a semi-utilitarian fa
is an ambiguous wall, its layering of wall and
reminding one of Roman buildings, although here
umns are revealed within the wall rather than b
perimposed upon it.[54] The emphatic wall segmen
left of Figure 33 continues below the cornice line
the square piers that divide the long facade in
segments, each of which contains seven round-fac
columns. Behrens chose an odd number of columns
a column rather than an intercolumniation woul
center. The asymmetric placement of entrances in
bays and the central column signified that this wa
all, only a side of a larger factory complex.

Behrens designed two other factories on the H
thain site, one of which is especially important fo
a subtle variation to the industrial format that h
oped for the AEG.[55] Figure 24 shows, at the sou
the extension to the Factory for Electric Railway
ment (Neue Fabrik für Bahnmaterial) and the A
Plant for Large Machines (Grossmaschinenfabrik
right in Figure 26.[56] The New Railway Factory
northern thirteen bays of the Assembly Plant we
in the winter of 1911–1912. These buildings compl
industrial courtyard which Behrens had concei
executed over the years 1909 to 1912. Figure 28 g
view as one entered through the northwest gate
Gustav-Meyer-Allee.

In concept and execution, the New Factory for
Railway Equipment (figs. 35, 38) was a slightly si
variant on the Small Motors Factory, displayin
strained colonnade to the Voltastrasse (fig. 35), a

33 AEG Small Motors Factory, Berlin. Peter Behrens, 1910–1913. Facade on the Voltastrasse.
34 AEG Small Motors Factory. Factory yard side.

34

35 Voltastrasse fronts of AEG factories at the Humboldthain, Berlin. Near to far, the Factory for Large Machines, the new and old Factories for Electric Railway Equipment, the gap for the site marked Berliner Elektricitäts-Werke in fig. 24, and the Small Motors Factory. A street in accord with Behrens's concept of modern urbanism.

36 AEG Factory for Large Machines, Berlin. Peter B 1911–1912. Interior.
37 AEG Factory for Large Machines. Viewed from n
38 AEG Factory for Large (bottom) and new extensio Factory for Electric Railw Equipment, Berlin. Plans

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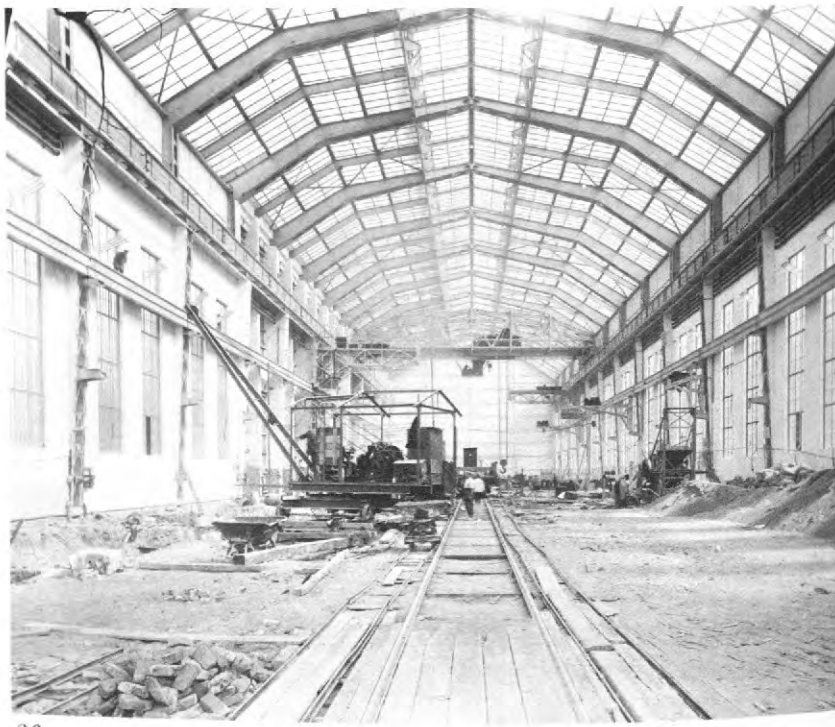
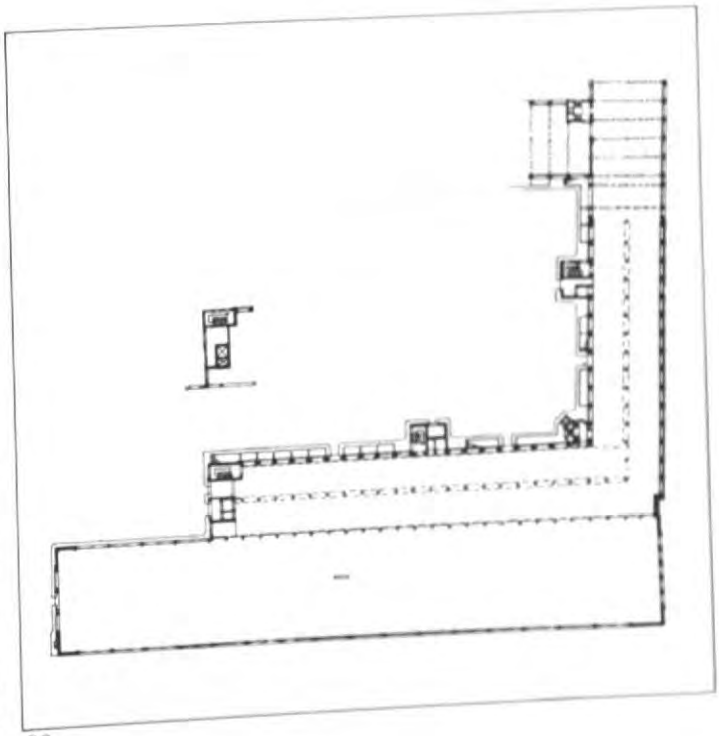


36

which in detail was closer to the courtyard elevation of the Small Motors Factory.

The Assembly Plant for Large Machines is a single large factory space with a thirty-meter span (fig. 36) and it presents an imposing end elevation at one corner of the site (fig. 35). To the north, a similar elevation appears, directly confronting the northwest gate (see figs. 26, 37). While these elevations invite comparison with the Turbine Factory, the points of arrival which they front do not necessitate a major representative gesture as in the earlier factory—even the northwest gate is principally for workers and freight. In contrast to the Turbine Factory, the north end elevation of the Assembly Plant (see fig. 37) is also the main point of entry; however, since Behrens would not celebrate mere function, the portal front of the Assembly Plant received a less elaborated form than the closed facade serving as the symbolic point of arrival at the Turbine Factory. The facade of the Assembly Plant, for all its formal impressiveness, is little more than a pragmatic terminal to a repetitive, wide-span structure; and yet this facade, too, should be distinguished from one such as that of the slightly later Siemens-Schuckert Factory (see fig. 21), which loses nothing of architectural impressiveness for being relentlessly pragmatic.



38

By the time of the Assembly Plant, Behrens seems to have been confident of integrating his own intentions with practical conditions. Perhaps the clearest indication of this new attitude is Behrens's use of iron framing (*Fachwerk*, as in the Siemens Factory [see fig. 21]) together with brick infill—a conventional system[57] which Behrens had formerly despised both for the linearity of the iron and the apparently insubstantial quality of the brick infill. The principal structural members of the Assembly Plant are three-hinged arches; however the cross-section of these elements is solid-walled throughout their length (see fig. 36), not just in the principal elevation as in the Turbine Factory. These solid-walled arches contrast sharply with the lightly framed skylights that extend from wall to wall. Arches, secondary bents, purlins, diagonal bracing, and glazing bars are here arranged in an easily recognizable hierarchy. The Assembly Plant employed no tie-rods; con-

76 sequently, the truss structures of the two high traveling cranes were free to operate in the faceted space under the arches.[58] The result is an interior (see fig. 36) that is much more comprehensible than that of the Turbine Factory (see fig. 14). The arches are carried on uprights that also support the beams of the crane tracks. In contrast to the superimposed verticals of the Turbine Factory, a single upright provides the critical place in the structure, which is simultaneously the top of the vertical support, the springing of the arch, longitudinal bracing, and crane track; this element is given a strong and rational articulation both inside and out (see figs. 36, 37). On the long facade, between the uprights and below the line of the crane track, a well-defined sequence of brick infill panels imparts a certain weight to the building (see fig. 37). Here Behrens comes close to approximating iron framing and brick infill as conventionally used in factories.

It would seem that Behrens's expressed wish for an architectonic embodiment of the "new nature" of technology was fulfilled in the Assembly Plant, while the arbitrary and ambiguous formulations that led to Bernhard's criticisms of the Turbine Factory were avoided (see figs. 37, 38). Characteristically, Behrens did not terminate the building by glass or brick infill within the plane of the last arch. He chose to establish an independent masonry construction at each end. The AEG signet (see fig. 37) was carved in the depth of the brick wall, and as this wall turned into the side elevation it remained outside the plane of the brick infill. Behrens's design eliminated two arches and transformed the required end closure into a structurally contributive element. When designed as simply as here, such a termination was a reasonable alternative to a design that employed only arched framing and infill (see fig. 4). However, the decision to bracket the production processes within these embodying end walls arose from abstract rather than technical reasons.

On his arrival in Berlin, Behrens came to accept contemporary industrial civilization resignedly; nonetheless he saw in it a "new nature" and the source of a "new spirit" which the artist had to master.[59] The more abstract aspect of Behrens's new spirit was built on the concept of a strongly interwoven industrial and socio-political
zation, as advanced by such men as Walther Ra
and Friedrich Naumann.[60] For Behrens the new
would come into being only through the interact
tween the social context *and* the creative man, er
with both tradition and critical acumen. Behrens b
that industrial civilization had brought about a s
and perceptual reorganization which implied a ne
of environment. The two faces of the AEG Small
Factory—the broad sweep of its street elevation (
33) and the articulated forms of its court side (
34)—illustrated Behrens's "rhythmic principle."
principle held that modern life had altered our per
of the environment. He argued that fast trains tra
us so rapidly that the effective image of the city is r
to a silhouette. Similarly, our rapid passage throu
city precludes any consideration of building details
conditions implied for Behrens an architecture of c
and serene planes which would be easily perceived
special details could be handled in a manner harm
with this intent, Behrens claimed, if one employed
conceived elements, contrasted or arranged in re
series.[62]

When Behrens visited the United States in 191
especially appreciated the accumulation of skysc
these huge particulars, he felt, added up to a
vertical body, and a tall urban body was necessar
vastly extended modern city was to have any sil
Furthermore, the competitive skyscrapers were
emblems of the drive of industrial civilization. As
modern entrepreneurial city, Behrens felt Be
needed such a silhouette;[64] but his own opportun
such work were at the scale of the street. If we
these formulations Behrens's call for a metronomi
trial pulse,[65] we have a fairly complete formal
for the street facade of the Small Motors Factory
contrast to the Sittesque program of an operation
ulation for the courtyard elevation.

In 1913, Walter Gropius, who had left Behrens's
build the Fagus Works, provided what he called t
thetic scaffolding" for a modern industrial archit

cisely characterized form, elimination of all that is incidental, clear contrasts, ordering of the elements, identical parts in series, and unity of form and color. While Gropius saw these qualities to be the correlates of the energy and economy of modern life, he also recognized that they were only guide lines, still in need of the fantasy of an artist. In industrial building, he acknowledged his former master Behrens and the AEG as the team that had first successfully embodied these modern characteristics in a factory.[66]

But as Gropius also noted, Behrens was inclined to emphasize understanding at the expense of feeling.[67] So Behrens's observations about man's altered perceptual, sensory, productive, societal, or political conditions remained just that: cool observations. He did not wax enthusiastic, as Le Corbusier would do in 1923 in the pages of *Vers une architecture*.[68] For Behrens "the Engineer's Aesthetic" celebrated by Le Corbusier was finally a false aesthetic. The engineer's calculations were universal, like Nature, and neither amounted to Culture. For Behrens, the engineer was, alas, the archetypal man of modern civilization. Such a qualified position could hardly serve as the basis for enthusiasm. Instead Behrens continued to endorse the traditional concept of culture. This endorsement permitted him to be critical of modernity and to claim that the artist had the will to reform the modern condition. And yet while one may admire this spirit of critique and reform, in practice Behrens exercised this will in an authoritarian manner, imposing *a priori* laws rather than allowing for conditions to test those laws and lead him to better formulations. Although the Assembly Plant for Large Machines represented a closer correspondence between idea and fact than was evident in the Turbine Factory, this conjunction was like the refinement of a grand theory through the addition of epicycles. The Assembly Plant remained a concretization of an ironic and pessimistic view of modernity. Indeed all of Behrens's AEG factories are cool monuments to the accommodation of giant magnitude, to the representation of the "new nature." Le Corbusier, on the other hand, within his apparent technological determinism, was to discover new opportunities. Eluding the learned detachment and aesthetic distance of Behrens, Le Corbusier presented his idea of the *esprit nouveau* as something to be lived. Behrens, in contrast, chose to complete, to close the serial processes which were present both in the functions and in the structures of his factories. He did not emphasize the environment as a place for human activity, nor architecture as a context for a fuller life. Instead the Turbine Factory was the expression of an ideal vision of a technological civilization related to earlier utopian visions. It was intended as something which ordinary men should "live up to," rather than as an occasion for evolving elements of use and enjoyment within a newly conceived and highly operational environment. Behrens sought to render his factories as monuments to an evolving social condition—monuments which were imbued with Spenglerian overtones of both engagement and ominous foreboding.

78 *Source Note: This essay is adapted from chapter seven of my doctoral dissertation, "Peter Behrens and the New Architecture of Germany: 1900–1917" (Columbia University, 1968). Together with chapters five and six of that dissertation (which have been published in* Oppositions *11 and 21), this chapter completes my discussion of Peter Behrens and the AEG. One should now also see the excellent work by Tilmann Buddensieg et al.*, Industrie-Kultur. Peter Behrens und die AEG. 1907–1914 *(Berlin: Gebr. Mann, 1979). See page 69 of* Oppositions *11 for further references and acknowledgements.*
During the final editing of this manuscript, I have learned of the untimely death of two former students. I would like to recognize Kenneth H. Kaiser for years of close friendship as well as shared interest and discussion on historical topics relating to this article. I wish also to remember Paul Birnbaum for more than is conveyed in the credits to his photographic work.—S.A.

1. From a conversation with Mies van der Rohe in his Chicago office, June 27, 1961. This assessment of the situation in Germany prior to the first World War is corroborated by Theodor Heuss, *Hans Poelzig* (Tübingen: Wasmuth, 1948), p. 31. Heuss cited Poelzig's Werdermühle of 1906 as an example of the simplicity allowed to utilitarian buildings. But, of course, the lack of preconceptions about the form of industrial buildings didn't necessarily imply a reductionist attitude. *Dekorative Kunst*, VII (Jan. 1901), 148, gave an exemplary presentation to a design, in limited competition, for a power station by Schilling und Gräbner of Dresden; this was an overwrought Sezessionist temple complete with atlantes and at least thirty-four ornamented chimneys belching Art Nouveau smoke.
2. See chapter eight of my dissertation as described in the source note.
3. See the discussion in my articles "Modern Architecture and Industry: Peter Behrens and the Cultural Policy of Historical Determinism," *Oppositions*, 11, Winter 1977 and "Modern Architecture and Industry: Peter Behrens, the AEG, and Industrial Design," *Oppositions*, 21, Summer 1980.
4. Iron construction, architecture as the forming of space, the concepts of *Tektonik* and *Stereotomie*, and prospects for architecture appeared as key topics in Julius Lessing's introduction to Alfred G. Meyer, *Eisenbauten. Ihre Geschichte und Aesthetick* (Esslingen a. N.: Neff, 1907).
5. G. Semper, *Der Stil in den technischen und tektonischen Künsten* (Munich: F. Brinckmann, 1878–79, 2 vols., 2nd ed.), vol. ii, pp. 341–2.
6. Jacob Burckhardt, *Geschichte der Renaissance in Italien* (Stuttgart, 1891, 3rd ed.), §32, p. 46, and §61, pp. 113–5.
7. It is now difficult to think of Gothic architecture in other than *spatial* terms. In view of the fact that "the orders" had long been the touchstone of classical architecture, however, and that the nineteenth century treated Gothic architecture first as "pointed" and then as "ribbed," it is easier to comprehend the categorization of such buildings as "material." The planes of Renaissance architecture seemed, by comparison, inert and primarily descriptive of the space enclosed. See also P. Frankl, *The Gothic* (Princeton, N.J.: Princeton University Press, 1960), pp. 606–7. In 1904, Alois Riegl still spoke of membered structure as distracting the observer from the "pure appreciatio
space"; quoted in Frankl, p. 637.
8. A. Schmarsow, *Das Wesen der architektonischen Sc*
(Leipzig, 1894).
9. A. Schmarsow, *Zur Frage nach dem Malerischen*, in
zur Aesthetik der bildenden Künste, I (Leipzig, 1896),
24.
10. One of Schmarsow's students, Wilhelm Niemeyer,
art historian under Behrens at the Kunstgewerbes
Düsseldorf and testified to Behrens's interest in Riegl
meyer, "Peter Behrens und die Raumästhetik seiner
Dekorative Kunst, X (Jan. 1907), pp. 131–76.
11. Ibid.
12. Another documentation of Behrens's independe
functional and technical factors was provided by K. E.
"Ein Fabrikbau von Peter Behrens," *Frankfurter Zeitu*
10, 1910, author's translation): "Among the modernists,
has long been almost alone in the view that one ca
creative basis for artistic form in function and techni
largely owing to Behrens that we today know how
optical and rhythmic values independently of questions
It is important to remain aware of the distinction betw
ideas and the concept of new forms evolving from a c
engagement with the given situation. The formal *exp*
of the adherents of these two methods may, at times, b
However, those devoted to the artist's formalization
lective will *will* see to it that their formal expecta
fulfilled. Those devoted to the exploration of a pro
prepared to have the dynamics of that situation alter, t
or even destroy their formal expectations.
Behrens and those of his persuasion triumphed over
were most open to the problematic situation, despit
pearance of clear and compelling articulations of the
ist" position earlier than the *Zeitgeist* formulations.
the following example. The first director of the Kuns
museum in Berlin, Julius Lessing, who like Franz Reu
been favorably impressed by the simple American p
the Philadelphia exposition of 1876, published an ins
ticle ("Neue Wege," *Kunstgewerbeblatt*, N.F. VI [(
pp. 1–5, author's translation). Lessing had developed
standing of late nineteenth-century eclecticism but
concerned to point the way beyond historical allusion.
his contemporaries to see iron girders as they saw
umns; to look for inspiration in railroad stations and
exposition of 1889 (Eiffel Tower and Halle des Machi
than in the sham edifices of Chicago's exposition
recognize that new lighting techniques and doorbe
new art forms. He again praised the American fur
hardware exhibited at Chicago, claiming they were
developed out of the materials and techniques involve
exceeded the calculations of reason and gave to the
joy which we call beauty." Lessing insisted that thos
the machine as an enemy could not be helped. "Whet
it or not, our work must be staked out on the gro
practical life of our time and must create those fo
bespeak our needs, our technique, and our materia

age, this form will not appear like the pious beauty of the Gothic or the luxurious beauty of the Renaissance, but rather as the perhaps somewhat austere beauty of the end of the nineteenth century—and that is all that one can ask of us."
See also Lessing, "Das Kunstgewerbe als Beruf," *Volkswirtschaftliche Zeitfragen*, no. 97 (Berlin: L. Simon, 1891).

13. See O. Wagner, *Moderne Architektur* (Wien: Spiehagen und Schurich, 1897); H. Muthesius, "Kunst und Maschine," *Dekorative Kunst*, IX (Jan. 1902), pp. 141–7; F. Naumann, "Kunst im Zeitalter der Maschine," *Kunstwart*, XVII (July 1904), pp. 317–27; J. L. M. Lauweriks, "Architektur," *Ring*, no. 4 (Apr. 1909).

14. The reliance of contemporary architects on accepted styles for factory buildings may be seen in C.Z., "Fabrikarchitektur," *Architektonische Rundschau*, XXVI (1910), pp. 65–72 and pls. 57–64.
The respectable, but not unusual, early stages of the AEG's factory construction can be seen in: Berlin, AEG, *Elektrischer Einzelantrieb in den Maschinenbauwerkstätten der A.E.G.* (Berlin: AEG, 1899). This book also gives a good impression of contemporary AEG machinery and of the graphics (conventional job printing; see also *Oppositions*, 11, p. 58 ff.) employed by the firm immediately before its flirtation with *Jugendstil*. Just as the AEG had, before Behrens's arrival, turned to a noted graphic artist, Otto Eckmann (ibid., p. 61), so too they had commissioned Berlin's most renowned architect of that time, Alfred Messel, for the design of a central office building on the Friedrich-Karl-Ufer in Berlin (1905–06). But this was an office building, not a factory, and of a sober, classicizing manner. In fact, this building should be recognized as a precedent for Behrens's general development, but not for his immediate contribution to the industrial architecture of the AEG.

15. The commencement in 1905–06 is recorded in [Berlin, AEG], *Ansichten aus den Fabriken Brunnenstrasse* (Berlin: AEG, n.d. [c. 1913–14]). F. Hoeber, *Peter Behrens* (Munich: Müller and Rentsch, 1913), p. 136, records the state at the time of Behrens's redesign (1908). The photograph for Figure 23, from the AEG-Archiv in Berlin, is dated June 30, 1909. This work thus constitutes Behrens's first, limited contact with industrial architecture. The Turbine Factory remains Behrens's first major work for the AEG. Its only other predecessors are the AEG pavilion for the Deutsche Schiffbauausstellung of 1908 in Berlin (see *Oppositions*, 11, p. 58) and a small AEG exhibition pavilion of 1907 illustrated without credit in *Mitteilungen der Berliner Elektricitätswerke*, III (Sept. 1907), p. 131. Both pavilions have characteristics closely allied with the work of Behrens's Düsseldorf period.

16. In the same year, incidentally, a complete 100 horsepower, direct-current AEG turbo-dynamo system of handsome construction won wide popular attention at the same Düsseldorf exhibition where Peter Behrens had built a garden and restaurant.
Hermann Muthesius, in "Die ästhetische Ausbildung der Ingenieurbauten," *Zeitschrift des Vereines deutscher Ingenieure*, LIII (July 31, 1909), p. 1212, cited the Düsseldorf exhibition of 1904 as the point when the modern movement in the arts and crafts recognized the beauty of the machine—an appreciation that was shared by the press.

17. Much of this information comes from: Berlin, AEG, *25 Jahre AEG-Dampfturbinen* (Berlin: AEG, 1928), pp. 1–27, 96–101.

18. This and most of the factual information about the executed building is taken from articles by the engineer of the building, Karl Bernhard: "Die neue Halle für die Turbinenfabrik der Allgemeinen Elektricitäts-Gesellschaft in Berlin," *Zeitschrift des Vereines deutscher Ingenieure*, LV (Sept. 30, 1911), pp. 1625–31, and (Oct. 7, 1911), pp. 1673–82. See also *idem*, "Die neue Halle der Turbinenfabrik der Allgemeinen Elektricitäts-Gesellschaft in Berlin," *Zentralblatt der Bauverwaltung*, XXX (Jan. 15, 1910), pp. 25–29. West of the well known Turbine Factory, Behrens built at the same time a small, handsome, and meticulously detailed power station in brick; see Hoeber, *Peter Behrens*, p. 114.

19. Works by Bernhard were illustrated in: Deutscher Werkbund, *Jahrbuch 1913* (Jena: Diederichs, 1913), pl. 48 (with Hermann Muthesius), and *idem*, *Jahrbuch 1914* (Jena: Diederichs, 1914), pl. 42.

20. In Behrens's article "Kunst und Technik," *Elektrotechnische Zeitschrift*, XXXI (June 2, 1910), pp. 552–5, he recognized the need to use new building materials such as iron but also continued his argument that no style could be achieved through material conditions alone. The conclusion he drew was that artists and engineers must collaborate—even referring to them as equals—but it was "good artistic form" that the buildings had to have. This belief in the supremacy of the artist was not heavily disguised from the audience of technicians to whom he was speaking.

21. Literally, "Machines roar in sacred songs/Factories are godly churches of power." Quoted in Lanzke, *Peter Behrens. 50 Jahre Gestaltung in der Industrie* ([Berlin?], 1958), p. [5]. This divine imagery contrasts interestingly with, and is perhaps an over-compensation for, the recurrent nineteenth-century conflation of industrial and infernal imagery. See the chapter "The Age of Despair" in Klingender, *Art and the Industrial Revolution* (London: Carrington, 1947). K. E. Osthaus, "Ein Fabrikbau. . .," found the Turbine Factory to be perfected "like a Doric temple."

22. The supports of this side hall have a span of 12.93 meters, center to center. The two traveling cranes for the ground level of this side hall had a capacity of 40,000 kilograms each and a span between supports of 11.44 meters; at the upper level, the cranes were designed for 10,000 kilograms each.

23. At the time of its completion, the Turbine Factory was Berlin's largest ferrous construction. For details, see Bernhard, *Z.d.V.D.I.*, IV, pp. 1625–31, 1673–81.

24. Just as Behrens participated in the transformation of factory imagery from the infernal to the divine (see note 21), so also he participated in an inversion of value associations related to the gigantism of modern industrial buildings. Hoeber, *Peter Behrens*, p. 165, pointed out that if Viollet-le-Duc thought that scale and proportion were based on the dimensions of man, then Behrens's industrial buildings were created for an industrial race of vastly increased power. That is, for Viollet-le-Duc man was the measure of his environment; for Behrens, the industrial environment was the measure of Man. There is in this an inversion of the dependent-independent relationship and a shift from man

80 the individual to Man as a race. Again the decision to deflect or rebut the criticism of industrial civilization led to over-compensation.

25. P. Behrens, "Die Turbinenhalle der Allgemeine Elektricitäts-Gesellschaft zu Berlin," in Düsseldorf, Rheinischer Verein für Denkmalpflege, *Mitteilungen*, IV (Mar. 1910), pp. 26–9. See also *Deutsche Technikerzeitung*, XXVII (Feb. 12, 1910), pp. 87–90.

26. Hermann Muthesius in *Zeitschrift des Vereines deutscher Ingenieure*, LIII (1909), p. 1213, traced back to Semper a common opinion that iron construction tended toward dematerialization and was therefore antithetical to the essential materiality of architecture. Praising the Eiffel Tower, Muthesius sought to expand the architects' range of aesthetic appreciation to include the transparencies of iron frameworks. Anticipating Muthesius' position, Friedrich Naumann had spoken of a new style which must have "iron bones" (1896) and repeatedly praised the Eiffel Tower. See Naumann, *Ausstellungsbriefe* (Berlin, 1909), pp. 31, 73, 103–9. Typically, Behrens sought to give the new material sufficient visual weight to bring it into conformity with a traditional esthetic; accordingly, he condemned the Eiffel Tower for its lack of corporeality: Behrens, *Elektrotechnische Zeitschrift*, XXXI (1910), pp. 552–5.

27. Bernhard, *Z.d.V.D.I.*, LV, p. 1630.

28. R. Banham, *Theory and Design in the First Machine Age* (London: Architectural Press, 1960), p. 83.

29. Bernhard, *Z.d.V.D.I.*, LV, p. 1628. On the multiple symbolisms of pylon, temple, crystal, and machine parts, see also chapters one through three of my dissertation as described in the source note. Chapter two appeared as "Peter Behrens's Changing Concept of Life as Art," *Architectural Design*, XXXIX (Feb. 1969), pp. 72–8.

30. Behrens, "Die Turbinenhalle... ," p. 26.

31. Ibid. Inspection does reveal light iron framing and diagonal bracing at the inner surface of the concrete pylons.

32. The same situation arose with the famous corner window of the Fagus Works by Walter Gropius. Using glass as the neutral transition from one elevation to the other avoided the ambiguous sense of support evident in the Turbine Factory. But like Behrens, Gropius arrived at this arrangement through visual explorations. "I liked it that way. Only later did I realize that there was structural logic to it as well." Gropius made these comments to me (Cambridge, Mass., Feb. 6, 1964) as a means of emphasizing the importance of intuition and feeling in the creative process. In his later works, too, Gropius explored the visual character of materials—in the Fagus Works a transparent material—not new conceptions of space. Like Behrens, he was not concerned about "destroying the box." On Gropius and transparency, see C. Rowe and R. Slutzky, "Transparency: Literal and Phenomenal," *Perspecta*, no. 8 (1964), pp. 45–54; reprinted in Rowe, *The Mathematics of the Ideal Villa and Other Essays* (Cambridge, Mass.: MIT Press, 1976), pp. 159–83.

33. Bernhard, *Z.d.V.D.I.*, LV, p. 1629. Without mistaking the structural elements of the factory, W. Müller-Wulckow found its expressive force to be in the concrete pylons and gable: in *Bauten der Arbeit und des Verkehrs aus Deutscher Gegenwart* (Königstein und Leipzig: Langewiesche, 1925), p. 24.

34. Behrens's relation to the classicism of 1800 bec
more evident in the works (see figs. 3, 7) discussed i
eight of my dissertation. One may note here that, ac
Harry Graf Kessler, Friedrich Gilly was the favorite
of Walther Rathenau. Rathenau bought the country se
which, though Kessler implies it was designed by
Gilly, was designed by Friedrich's father David (1798
Walther Rathenau (New York: Harcourt, Brace, 193
Hermann Schmitz illustrates the elegantly simple
Freienwalde (five two-storied bays controlled by flat g
ters) and credits Rathenau as one of the first and m
admirers of the classicizing architecture of 1800 (see hi
Baumeister vom Ausgang des achtzehnten Jahrhund
lin: Wasmuth, 2nd ed., 1925], pl. 206 and p. 330).

35. Anon., "Peter Behrens," *Allgemeines Lexikon d*
den Kunst des XX. Jahrhundert, H. Vollmer, ed. (Le
mann, 1953 ff.), I, pp. 157–8.

36. The Frankfurt and Hamburg buildings are illustra
187–8 of G. A. Platz, *Die Baukunst der neusten Ze*
Propylaen, 1927).

37. J. M. Richards, *An Introduction to Modern A*
(2nd ed., Harmondsworth: Penguin, 1953), p. 76.

38. H. R. Hitchcock, "Peter Behrens," *Encyclopedi*
Art (New York: McGraw-Hill, 1959ff.), vol. ii, col. 41

39. This factory and Krupp's Eleventh Cannon Work
built over a period of a few years beginning in 1906
illustrated in: Essen, Krupp, *Fried. Krupp Aktieng*
(Essen: Krupp, 1927), p. 10; and W. Berdrow, *Alf*
und sein Geschlecht (Berlin: Krupp, 1937), p. 205.
both shops illustrated in D. Baedeker, *Alfred Krup*
Entwicklung der Gusstahlfabrik zu Essen (Essen:
1912, 2nd ed.), plates following p. 278. Dates and stat
first work cited in this note, p. 34, and in Essen, Krup
A Century's History of the Krupp Works. 1812–19
Krupp, c.1912), pp. 323–4.

40. Essen, Krupp, *Fried. Krupp Aktiengesellschaft.*
Data (Essen: Krupp, 1907), pp. 87–93.

41. The best of such factories are architectural para
process-oriented design of Thonet chairs which I d
the related article in *Oppositions*, 21. Such works b
the simplistic notion of technical solutions *plus* ae
notion that stood behind much of the (often slightly o
factory architecture around 1900. For example, the a
in one handbook: "Considerations about the architec
nization of the whole take only a second place. Onl
functional form has been established in all its part
reflect on how this functional form is to be brought i
with the most suitable aesthetic form." Wilhelm Rebb
anlagen (Leipzig, 1901, 2nd enl. ed.; first pub. 1
(author's translation).

42. Most industrial cities in the United States could a
examples.

43. In a formulation such as Rebber's (see note 41), th
characteristics were superimposed on the functional
situational approach was capable of drawing these to
could not claim to generate forms that were immedi
cable, or stylistically appropriate to other new situa

third formulation, Behrens conceived of technical and artistic forms as separate, and sought to control the utilitarian aspect by his artistic form. He did feel that modern times required that the artistic form be related to the conditions of industrial civilization, but he believed that forms could be generated which were general to the time and applicable in various situations. That is, Behrens sought the formal basis for a contemporary style, as recognized in Karl Scheffler's commentary (*Vossische Zeitung* [Berlin, Sept. 26, 1912], author's translation) on the AEG factories: "One would, with praise, stress the eminent cultural sensibility of the AEG which can be of the greatest significance for the future in as much as its architectonic products allow one to glimpse the nuclei of a new, modern, international architecture—the seed of a new 'Style'." Intimations of an International Style!

44. For this reason, the complex was also referred to as the "Factories at Brunnenstrasse," although none of the factories fronted directly on that street.
See Berlin, AEG, *Elektrischer Einzelantrieb...* (1899); Berlin, AEG, *Ansichten aus den Fabriken Brunnenstrasse* (Berlin: AEG, n.d. [c. 1914]), a picture book; and Berlin, AEG, *Führer durch die Fabriken Brunnenstrasse* (Berlin: AEG, 1929), a guidebook. A. Fürst, in *Emil Rathenau* (Berlin, 1915), reported the following statistics as contemporary with his work: area of site 117,628 square meters; floor area, 211,130 square meters; 14,000 workers.

45. A slightly later, but very similar design appears as Figure 164 in Hoeber, *Peter Behrens*. The pairs of windows in the street front of the pylons were shifted to the side elevation, thus preserving the massive portal from any reference to domestic scale. The only other significant change in the design illustrated by Hoeber was the addition of windows in the side elevation of the two-story block at the right of the drawing. The four-story building at the far right was an existing building which, along with all the residential buildings facing on the Hussitenstrasse, were later demolished to make way for Behrens's Assembly Plant for Large Machines.

46. Franz Mannheimer records that this factory was completed in the summer of 1910, "Arbeiten von Professor Peter Behrens für die AEG," *Der Industriebau*, II (June 15, 1911), p. 127. All the factories on the site still exist.

47. The two small buildings to the southwest of the Kleinmotorenfabrik on the Voltastrasse were earlier constructions and part of the Berliner Elektricitäts-Werke (BEW). The BEW was the electric utility corporation for Berlin. The AEG was commissioned to administer and develop this utility company with control reverting to the municipality in 1915. See A. Fürst, *Emil Rathenau* (Berlin, 1915).

48. Hoeber, *Peter Behrens*, p. 58, has rightly pointed out that Behrens's unpremiated competition design for the Tietz Department Store in Düsseldorf (1906; competition won and building executed by Joseph Olbrich) was a precedent for the High Tension Factory. Behrens's department store design was singular in his oeuvre until the High Tension Factory. Distinctive in these two buildings are the wholly masonry exteriors, the exterior detailing of a simple classicizing character which unifies the repetitive bays; the clear articulation of stairs and elevators in plan and in external detailing; and skylines broken by elements that indicate separate uses below.
The factual information on the High Tension Factory is from Mannheimer, *Der Industriebau*, II (1911), pp. 121–40.

49. Neither of the bay dimensions of these facades was set by the structure immediately behind the facades. The beams in these assembly line floors span perpendicularly to the facade, at the third points of the large bays established by the main assembly halls (fig. 30). These smaller floors were probably framed in this way in order to maintain a constant beam size (with no deep girders) over the assembly lines.

50. In their material (red brick) and their form and detail, these towers are reminiscent of the late medieval brickwork celebrated a century earlier by the eminent classicist Friedrich Gilly. See, e.g., Figure 20 and A. Rietdorf, *Gilly. Wiedergeburt der Architektur* (Berlin: Hans von Hugo, 1943), pp. 32–3.

51. C. Sitte, *City Planning According to Artistic Principles*, G. R. and C. C. Collins, trans. (New York: Random House, 1965) and G. R. and C. C. Collins, *Camillo Sitte and the Birth of Modern City Planning* (New York: Random House, 1965).

52. P. Behrens, "Seeking Aesthetic Worth in Industrial Buildings," *American Architect*, CXXVIII (Dec. 5, 1925), p. 476. The German version appeared as "Werbende künstlerische Werte im Fabrikbau," *Das Plakat*, XI (June 1920), pp. 269–73.

53. On the Kleinmotorenfabrik, see Mannheimer, *Der Industriebau*, II (1911), pp. 121–40. Construction of this long building began at the western end in 1910; by the summer of 1911 construction had been terminated at the tenth bay on the street side. By the fall of 1912 over half of the 196 meter long building was completed (Hoeber, *Peter Behrens*, p. 140). Berlin, AEG, *Ansichten aus den Fabriken Brunnenstrasse* (Berlin: AEG, n.d. [c. 1913–14]), pl. 4, gives the completion date as 1913.

54. This comparison is more fully discussed, with reference to the German Embassy in St. Petersburg, in chapter eight of my dissertation.

55. Mention should be made of other industrial or commercial works by Behrens for the AEG, although they do not give rise to significantly different discussion. These include the AEG appliance shops in Berlin, one in the Königgrätzerstrasse, the other in the Potsdamerstrasse (1910); see Hoeber, *Peter Behrens*, pp. 155–63; apparently these shops no longer exist. At the Turbine Factory site in Berlin was the Munitionsfabrik (1916); see T. Buddensieg et al., *Industriekultur* (Berlin: Gebr. Mann, 1979), pp. D24–5. A factory about which little is known is that for the AEG in Riga, Latvia (1913); see P. J. Cremers, *Peter Behrens* (Essen: Baedeker, 1928), p. 25. At Hennigsdorf near Berlin, another significant but lower-density AEG industrial site, were the Porzellanfabrik (1910–11) and the Öltuchfabrik and the Lackfabrik (1911), the Lokomotivfabrik (1913), and the Flugzeughalle (1915); on these factories, see Anon., "Einige Neubauten von Professor Peter Behrens, Berlin," *Industriebau*, VI (Aug. 15, 1915), pp. 396–9; and Buddensieg, *idem*, pp. D83–93. In Berlin–Oberschöneweide was the factory for the Nationale Automobil AG (1915–16); *idem*, pp. D94–7. Further works include a showroom in the AEG's old Apparatefabrik (ill. in Deutscher Werkbund, *Jahrbuch 1913*, pl. 80), and the AEG exhibition pavilion in Brussels (1916); Buddensieg, *idem*, p. D7.

56. Constructionally related, these factories are usually discussed together: Hoeber, pp. 144–50; *idem*, "Die neuen Bauten von Peter Behrens für die AEG," *Kunst und Künstler*, XI (1913), pp. 262–6; Berlin, AEG, *Ansichten...*, pls. 1, 5–7; Franz Mannheimer, "AEG-Bauten," in Deutscher Werkbund, *Jahrbuch 1913* (Jena: Diederichs, 1913), pp. 33–42 and pls. 2, 4; Anon., "Grossmachinenhalle der AEG in der Hussitenstrasse in Berlin," *Der Industriebau*, VI (Sept. 15, 1915), pp. 411–2.

57. Interesting examples of this type of construction are illustrated in: Munich, Die Neue Sammlung, *Industriebauten 1830–1930* (Munich: Die Neue Sammlung, 1967).

58. The text to note 28 above pointed out that this was not the case at the Turbine Factory despite its high-shouldered, faceted arches. At the Montagehalle the space was available, but Behrens diminished the "shouldering" by eliminating two "facets." Again Behrens's form depends on his volition rather than on technical considerations, although the basis for the form that Behrens willed may at this point be something as modest as a sympathy with neighboring gable forms (figs. 23, 37).

59. "It is precisely the inner organism of a building that serves industrial purposes which must be clearly retained and which must come to be the origin of a new beauty that bespeaks the spirit of our time. Everything great that will be created in life is the result not of a scrupulous professionalism, but rather of the energy of a great and strong personality."
P. Behrens, *Elektrotechnische Zeitschrift*, XXXI (1910), p. 554 (author's translation).

60. See the earlier articles in this series, *Oppositions*, 11, 21.

61. This discussion is based on the work cited in note 59. See also Behrens, "Kunst und Technik," *Werkkunst*, VI (1910–11), p. 132; *idem*, "Uber den Zusammenhang des baukünstlerischen Schaffens mit der Technik," in Berlin, Kongress für Ästhetik und allgemeine Kunstwissenschaft 1913, *Bericht* (Stuttgart, 1914), pp. 251–65; *idem*, "Einfluss von Zeit- und Raumausnutzung auf moderne Formentwicklung," in Deutscher Werkbund, *Jahrbuch 1914*, pp. 7–10.

62. M. Creutz, in "Das Krematorium von Peter Behrens in Hagen in Westfalen," *Kunstgewerbeblatt*, XX (Dec. 1908), pp. 41–8, referred to Behrens's reliance on what he called the "*Prinzip der unendlichen Musterung.*"

63. A. Behne, Preussiche Jahrbücher, *CLIV* (Oct. 1913), p. 172.

64. P. Behrens, "Zustimmung der Städtebauer," in *Berlins dritte Dimension. Offener Brief an Herrn Oberbürgermeister Wermuth* (Berlin, 1913), pp. 9–11.
"There is no longer any doubt that Berlin will increasingly be a new city of business. Therefore, rather than suffering this inevitability with a lighter or heavier heart, nothing could be more correct than that one purposefully aspire to this character and that all measures which are taken in the interest of the city seek fully to realize this character. The characterization—the creating of a type—is for every art, and not least for architecture, the most important moment in the whole of form-making (*Gestaltung*). One can imagine nothing more imposing than the realization of a unified character and stylistic idea for an entire city.
". . . In the aesthetic realm—and quite generally—that which made the greatest impression on me in America was without question precisely the giant office buildings. These office buildings, in their bold construction, carry the seed of a new
tecture.
"Nevertheless, one cannot be convinced of the correctn
this building principle solely by the impression that one
to work upon oneself; but rather this conviction must a
supported by an aesthetic consideration. A city should s
an urbanistic sense, be comprehended as a contained ar
tural image. A metropolis that spreads out incomprehe
will not, in a spatial-aesthetic sense, be helped by a cons
layout of squares. Similarly the effect of a church tower v
to affect the total image of an excessively flat, spreadin
such a horizontally extended plan needs corporeality, whi
only be found in the joining of compact vertical masses."
(Author's translation from a public letter originally publis
the *Berliner Morgenpost* [Nov. 27, 1912].) Behrens's in
these compact vertical masses appeared as the cover in
a special issue of *Das Plakat* (June 1920, fig. 39).

65. Hoeber, in *Peter Behrens*, p. 216, refers to Behrens
form repetition of a coordinated type with the resultant
movement of the factory facades, in contrast to the rh
intensificaton toward the center of a Renaissance facade.

66. Walter Gropius, "Die Entwicklung moderner Indust
kunst," in Deutscher Werkbund, *Jahrbuch 1913*, pp. 17–

67. W. Gropius, *Apollo in der Demokratie* (Mainz/Berli
rian Kupferberg, 1967), p. 125.

68. Le Corbusier, *Towards a New Architecture*, F. E
trans. (New York: Praeger, 1946), p. [16.] French origina

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6 From Essen, Krupp, *Friedr. Krupp AG* (Essen: Krup
1927).
7 Courtesy of Auswärtiges Amt., Bonn.
8, 9 From J. L. M. Lauweriks, "Architektur," *Ring*, no.
April 1909.
11, 12, 18 From Karl Bernhard, "Die neue Halle für die
Turbinenfabrik der AEG," *Zeitschrift des Vereines deut*
Ingenieure, LV, no. 39, Sept. 30, 1911.
13 From W. W. Schutz, *Unteilbares Deutschland* (Berli
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15, 16, 35 Courtesy of Paul Birnbaum, Boston.
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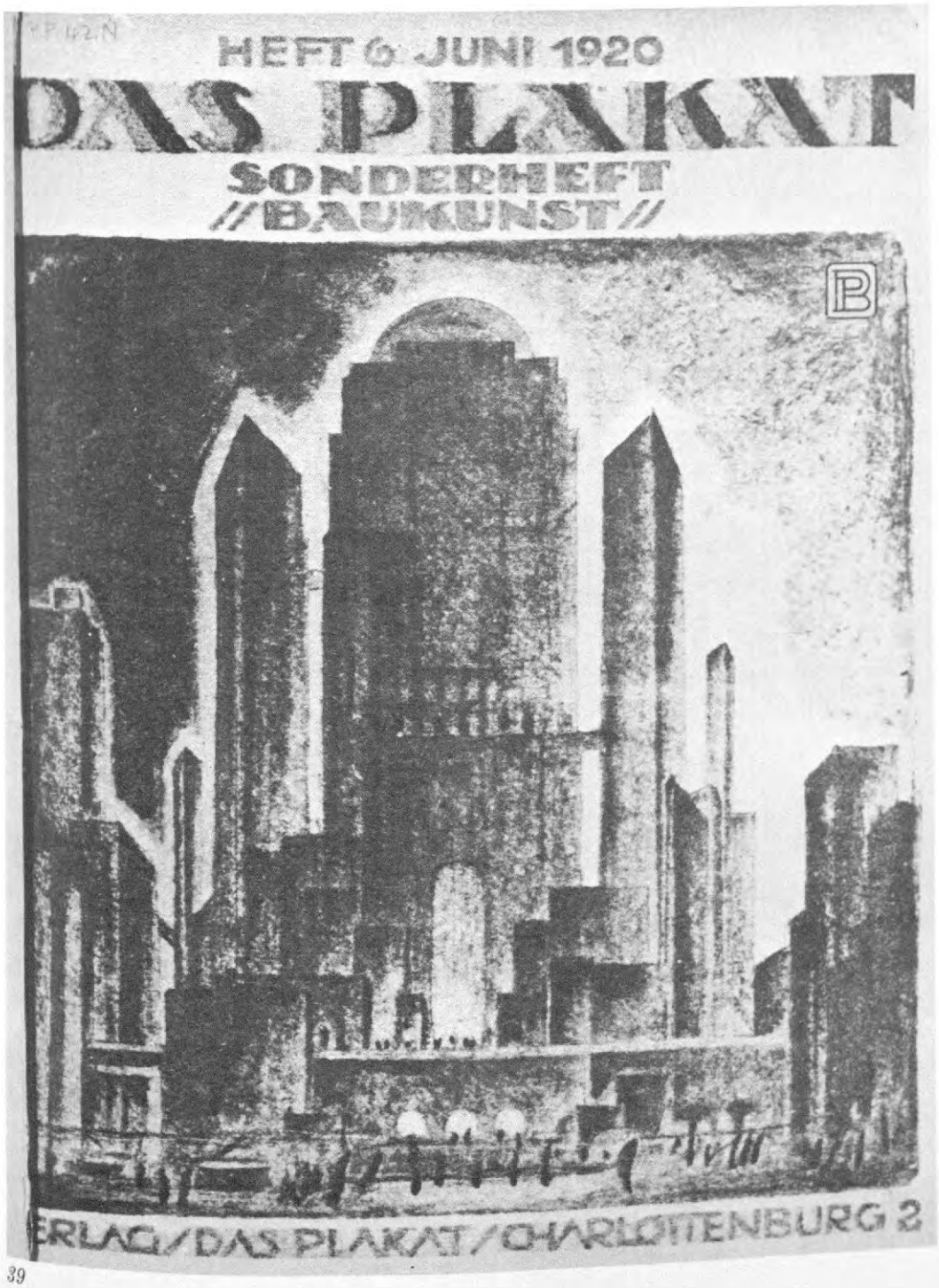
Romantik (Mainz: Matthias-Grünewald-Verlag, 1952).
30, 38 From F. Hoeber, *Peter Behrens* (Munich: G. Mü
E. Rentsch, 1913).
31 From R. Breuer, *Deutschlands Raumkunst und*
Kunstgewerbe auf der Weltausstellung zu Brüssel, 191
(Stuttgart: Julius Hoffman, 1910).
39 From *Das Plakat* (June 1920). Courtesy of British L

39 Peter Behrens. Image of the "compact vertical masses" of the modern city as inspired by American cities and advocated by Behrens. Published 1920.



39