Henri Coandă's Prefabricated Dwellings Between France and Romania

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The First World War left behind a devastated Europe all the more so since the destructions caused by the war deeply affected all branches of the economy. Thus, along the reconstruction of buildings and infrastructure, the solving of the acute housing shortage that affected big cities was among the political priorities of the third decade of the 20th century, in a context where the required manpower was deficient.

The intense efforts to solve the major emergencies of the moment have generated innovative technical solutions. The war itself had been a period of great advances in scientific knowledge and generated an unprecedented diversification of the construction techniques. As Jean-Louis Cohen asserted "the war served as an accelerator of technological innovation and production that would lead to the supremacy of modernism in architecture."[1] Industrialists, authorities, building professionals sought to adapt the innovations of war to the economic conditions during peace time.

This drive was especially manifested in housing, and particularly in social housing. The problem of housing shortage was far from new in most countries (ever since the Industrial Revolution and the dramatic urban growth of the 19th century), but it took a decisive turn in the aftermath of the First World War, when housing programmes gave a strong impetus to innovations and empowered a total reform of the traditional building techniques. Governments all across Europe were facing the difficult task of regenerating the squalid urban areas by providing them with safe and healthy, yet affordable homes. This implied state intervention and public subsidies which encountered constant economic problems – shortage of construction material, continuously increasing costs of labour and financial crises often interfered with governments' good intentions.

An unprecedented architectural thinking was being summoned to meet the social and political demands. Architects, engineers, building professionals responded to this call for exploration. New demands, new typologies, new shapes, new constructive systems, and new definitions of comfort triggered technical novelties within the limits of an economic and rigorous construction.

Social housing being an important engine of innovative architectural thinking in the 20th century, the immense task of reconstruction encouraged the exploration of the potential uses of industrial production techniques in architecture. Predicated on American models of industrial rationalization (Taylorism, Fordism and other systems of Scientific Management) a new ideology was conquering Europe, one that associated technology and social regeneration. This thought – far from being apolitical – became fundamental for the practice and theory of the major actors of the Modern Movement.

1 Jean-Louis Cohen, press release statement of the exhibition "Architecture in Uniform," Canadian Centre for Architecture, May 2011.

Henri Coandă's prefabricated dwellings

The 1918 truce found the 32 years old aircraft engineer Coandă settled in France. In Romania, largely thanks to his social and class status, he used to circulate among the intellectual and political elite of Bucharest,[2] while in France (as in Great Britain), he was already known as an aerodynamics inventor and a builder of an experimental aircraft.[3] During the war, at the Dellaunay-Belleville plant, he had been conceiving flight and combat apparatus, at the pace dictated by the warfare. But with the end of the war, all orders had been cancelled and aircraft manufacturers had to reconvert.[4] Since 1916, Coandă had been exploring substitute materials for the battlefield. In the building industry, the shortage of steel (essential for the war) boosted the use of reinforced concrete, thus giving rise to a massive flow of innovation. In the first decade of the 20th century, reinforced concrete turned out to be the first building technology to allow the construction of continuous surfaces with complex geometries. Ease and rapidity of execution, high strength, incombustibility and fire resistance quickly made the application of this new material go beyond the sphere of the building industry. Henri Coandă invented and used new technologies based on the use of reinforced concrete for building tank wagons, tank trailers, barrels[5] and, between 1917 and 1919, he commercially exploited various patents, including its own shotcrete machine. Nevertheless, after the significant progress of the French steel industry and its gradually increasing production capacity in the 1920s, the Romanian engineer had to reconvert his business again, as there was no demand for reinforced concrete tanks.

Politics also lent a hand: according to Coandă, it was the former French Prime Minister Alexandre Ribot who directed him to "a new and broad field of activity."[6] The French state policy of the moment was aiming at the development of individual housing.[7] Public funding of construction expanded significantly after the First World War with the establishment of measures encouraging the construction of regional government offices and low-cost social housing. The second Ribot Act of 192[8] institutionalized state aid to small landowners who had no financial means to build, and provided the most disadvantaged social classes with preferential financing conditions for the construction of houses.

In this context, Henri Coandă conceived and developed a fast construction method based on the use of arched precast concrete elements. On March 25, 1921, he filed in France the documentation for obtaining the patent for: "Reinforced Concrete Elements for all Construction"

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2 Henri Marie Coandă (1886-1972) was the maverick son of a general in the Romanian army, Constantin Coandă (1857-1932), politician, mathematician and university professor at the National School of Bridges and Roads in Bucharest. His mother, Aida Danet (c1865-c1945), born in Brittany, was the daughter of French physician Gustave Danet.

3 At the age of 24, Coandă designed, built, tested and piloted the first attempt of a jet propulsion airplane in the world. The unconventional aircraft Coandă-1910 was a major attraction at the Second International Aeronautical Exhibition in Paris in October 1910, being the only exhibit without a propeller. With this experiment the young engineer gained the attention of professional circles interested in aviation.

4 As recounted by Coandă himself, in Vasile Firoiu, *Din nou acasă...: Convorbiri cu Henri Coand*ă [*Home Again...Conversations with Henri Coandă*] (Bucharest: 100+1 Gramar, 2002).

5 Between 1910 and 1914, reinforced concrete barges were designed and built in Germany, the United Kingdom, the Netherlands and the United States; In 1917 Norway launched the first self-propelled craft built of the same material. But Henri Coandă was the first to rely on the versatility of reinforced concrete to build railways and road tanks.

6 Firoiu, *Din nou acasă*; Alexandre Ribot, (born Feb. 7, 1842, Saint-Omer - died Jan. 13, 1923, Paris) was four times prime minister of the Third Republic.

7 France already had a tradition of state intervention in the provision of social housing. After many years of debate, the society of Habitations à Bon Marché (HBM) was created in 1889. The Siegfried Act of 1894 laid down legislation for encouraging the building of low-cost dwellings for people of limited means. The 1908 Ribot Act created mortgage companies (*sociétés de crédit immobilier*) that borrowed money from public financial agencies and in turn made low-interest loans to workers.

8 The second Ribot Act of 1922 and the Loucheur Act of 1928 came to consolidate the Siegfried Act in 1894.

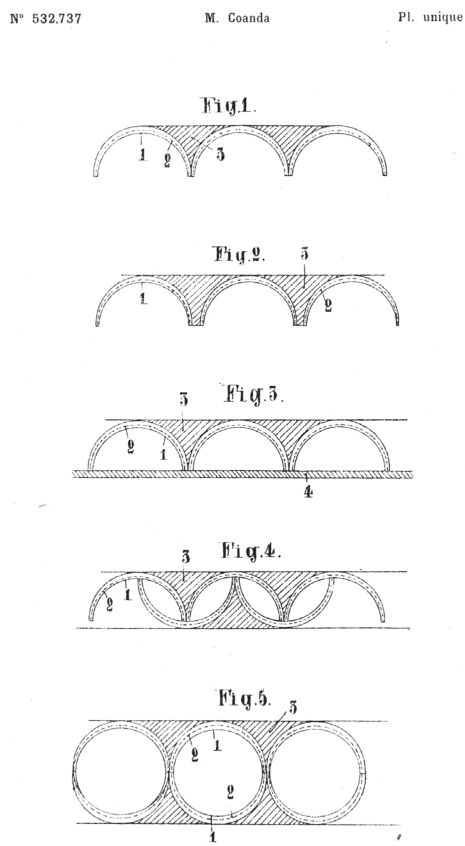


Fig. 1: Patent drawing, French Patent No. 532.737 / 25.03.1921

(Fig. 1).[9] His pre-moulded arched elements (the French term is *voûtain*) served as formwork for concrete sprayed on site, and the result consisted in hollow walls, floors and roofs. The description specifies that the elements to be patented are "fabricated beforehand" in a factory or on the building site. For this process Coandă also conceived a special concrete that he named "granite concrete", which was sprayed by means of steam pressure. The technology was based on replacing water with steam in the concrete production process; a mixer and spraying machine were specially designed and also patented. With small variations, this building system was patented in Romania, the United Kingdom and in the Kingdom of Serbia, Croatia and Slovenia. A limited company

9 Patent claims: "1. Reinforced concrete building elements [...] characterized in that the said elements are approximately semi-circular in shape and of substantially the same thickness throughout. 2. Floors, walls, roofs or other structures built of reinforced elements as claimed in Claim 1, the said elements being arranged side by side with a filling of concrete between the convex faces of the said elements. 3. Reinforced concrete structures as claimed in Claim 2 characterized by a partition against which the edges of the said elements abut, the whole being bond together with concrete to form a hollow structure. 4. Reinforced concrete structures as claimed in Claim 2 characterized by two rows of the said elements, one of the said rows being inverted and the elements in that row either alternating with the elements of the other row or arranged with their edges abutting against the edges of the said other row, the whole being bound together with concrete to form a hollow structure."

was established for immediate exploitation of the invention in France, Belgium and Romania. The company's commercial offer consisted in delivering low-cost houses. (Fig. 2-3).

Based on the ample correspondence and the photographs kept in Coandă's personal archive, we managed to identify one house actually built in Paris that followed the patented construction procedure, in the 19th *arrondissement*, Place du Danube (today Rhin-et-Danube), Mouzaïa district.[10] As the pictures testify, the floors and walls were made of arched precast concrete elements (Fig. 4-8). A letter from the archive reports that, as a result of this successful experiment, Coandă's company received an order to build another 50 houses in Paris, among which 11 were probably located in the same neighbourhood, where the nature of the foundation ground required lightweight construction, but this supposition is not yet confirmed.[11]

In Romania, where the modern economy was in its beginnings,[12] the housing problem became public policy only in 1910, when the Communal Society for Low-Cost Housing (*Societatea Comunală pentru Locuințe Eftine*) was founded with the mission to facilitate the access to housing for the underprivileged urban population. This new policy attained a more mature level in 1921, when an important number of legislative measures were issued as a result of the social concern following the end of the World War and the subsequent unification with Transylvania.[13] The state needed to mobilize land and financial resources in order to provide affordable housing for the growing disadvantaged population. Three types of interventions have been identified: houses built by the state, in order to be sold or rented out, public loans for private construction of houses, and allocations of plots resulted from new divisions of the state-owned land, to be further constructed upon by the owners.[14] All these legislative measures were also important stimuli for the activity of construction entrepreneurs.

Against this background, Coandă's experiment in France did not go unnoticed by the Romanian authorities and the progressive milieus concerned with housing. From February to July 1921, an ample correspondence kept in Coandă's personal archive focuses on both the reconstruction works necessary after the war, and the social housing in Bucharest. The deputy administrator of *Reconstrucția* Agency, architect Ion N. Socolescu, travelled to France to investigate the innovative construction system. Subsequently, Coandă was invited to present his ideas regarding the rehabilitation of war-ravaged regions before the representatives of the Romanian Government.[15] In February 1921, Coandă's construction company presented an offer concerning the reconstruction of the whole region of Dobrogea by building 5,000 dwellings, new roads, new bridges, and installing a cableway for the transport of materials. After the completion of construction works, this cableway would have been converted into a permanent means for transporting agricultural products from the villages of Dobrogea to the neighbouring important cities. The first 150 houses were to be built in the proximity of the Danube, near Cernavodă,

10 Worker's housing development conceived in 1901 by the French architect and entrepreneur Paul-Casimir Fouquiau, on the site of a decommissioned gypsum quarry.

11 The sloped terrain and the numerous underground galleries, on one hand, and the narrowness of the plots (around 4 meters), on the other hand, imposed the same typology for all the houses. The approximately 250 dwellings built in different stages, between 1901 and 1940, complied all with the initial regulation set by Fouquiau: two-story terraced houses with the same facade type, with very narrow entrance door, narrow windows and no adornments. As the photographs testify, Coandă's house is not different.

12 Romanian modern economic evolution, mostly produced by the political will of the Enlightened elites in propitious international circumstances, was spectacular when compared with the unprepared background against which it developed, namely a belated medieval society and a rudimentary agrarian economy. However, it was far from its West European counterparts, and so were its outcomes. See for example, Bogdan Murgescu, *România* și *Europa. Acumularea decalajelor economice (1500-2010)* [*Romania and Europe. Accumulating Economical Setbacks (15000-2010)*] (Bucharest: Ed. Polirom, 2010).

13 The Law on the Establishment of "Reconstrucția" Society, The Agrarian Reform, The Law for Encouraging Building, The Law for Providing Property for People with Disabilities, Widows Caring for War Orphans, and Public Servants, The Law for Organizing "Casa Muncei C.F.R." etc.

14 Conclusions of Irina Calotă's research on the evolution of housing policies in modern Bucharest. See Irina Calotă, *Dincolo de centru. Politici de locuire* în *București, 1910-1944* [*Beyond the Center. Housing Policies in Bucharest, 1910-1944*] (Bucharest: Ed. Ozalid, 2017).

15 According to the correspondence preserved in Coandă's personal archive.

Établissements HENRI COANDA

TÉLÉPHONE
Central 64-18
Louvre 55-69
Inter. 929

6, Rue de Rome, PARIS

ADRESSE TÉLÉGR. :
Coandoc

CONSTRUCTION D'HABITATIONS
EN BÉTON ARMÉ

suivant les procédés H. COANDA

BREVETÉ S. G. D. G.

Construction bon marché réalisé avec le procédé H. Coanda.

Principe de la construction. — Ces habitations sont constituées par des éléments moulés à l'avance (fig. 1), servant de coffrage pendant la construction, puis recouverts de béton, sur place par projection, à l'aide d'une machine spéciale brevetée. On obtient ainsi les planchers, les toits, les murs.

Les murs verticaux, complétés par une paroi interne, sont creux.

Béton employé. — Les mortiers de béton employés sont de 3 sortes :

1°. — Ceux constituant les éléments moulés à l'avance, dosés à 550 kgs de ciment par m3.
2°. — Ceux revêtant ces éléments sur place, dosés à 350 kgs de ciment par m3.
3°. — Ceux constituant les parois internes, à base de sciure de bois.

Description des parois. — Les parois (fig. 2) sont réalisées par le dispositif breveté suivant :

Une paroi plane constituée par des panneaux de bois démontables (seul coffrage employé) est dressée suivant le mur à élever puis, le grillage garnissant les parois internes est disposé.

A l'aide de la machine brevetée à projeter le béton (fig. 3), une première couche de béton (composition 3) est appliquée sur une épaisseur de 2 cm.

Des voutains d'un profil déterminé et moulés à l'avance sont ensuite appliqués sur cette paroi et liés ensemble par des attaches simples. Ces voutains sont faits avec la composition 1.

Une nouvelle projection à la machine est appliquée avec la composition 2 et constitue la partie externe du mur.

Toutes les parties verticales sont faites suivant cette méthode.

Les planchers et le toit ne comportent pas forcément de paroi interne en matière n° 3, mais elle peut être établie sans difficulté s'il est désiré.

Une organisation très simple des chantiers permet à ces opérations de se succéder sans immobilisation inutile de matériel et perte de main d'œuvre.

L'édification d'un tel ouvrage est très rapide du fait du procédé lui-même et de la rapidité de durcissement des matériaux employés.

fig. 1
Voûtains moulés à l'avance.

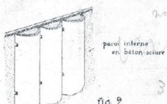


fig. 2
Élément de mur

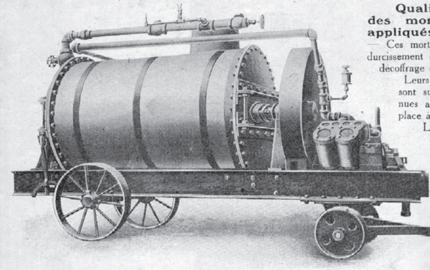


Fig. 3. — Machine à projeter.

Qualités particulières des mortiers de béton appliqués à la machine. — Ces mortiers ont une rapidité de durcissement qui permet d'envisager le décoffrage dans les 48 heures.

Leurs qualités de résistances sont supérieures à celles obtenues avec les mortiers mis en place à la main.

Les mortiers employés pour les parois internes à base de sciure, permettent l'enfoncement des clous avec autant de facilité que le bois.

Le prix de revient du m3 de béton confectionné, mis en place avec la machine est de beaucoup inférieur à celui résultant de la confection par bétonnière et mis en place à la main.

Le pilonnage est d'une régularité absolue.

Surcharges envisagées dans les calculs.

Toit : 120 kgs par m2 normalement au versant. — Plancher bas : 600 kgs par m2.
Plancher haut : 200 kgs par m2. — Pression des fondations sur le sol : 900 grs. par cm2.

Les pourcentages d'acier nécessaires pour cette construction sont de :

Pour les toits : 47 kgs au m3 de béton. — Les murs : 19 kgs au m3.
Les planchers : 50 kgs au m3. — Les fondations : 10 kgs au m3.

ce qui fait une moyenne de 35 kgs au m3 pour l'ensemble de la construction.

C'est là un pourcentage d'acier très faible.

Il est donc possible avec ce procédé d'envisager des constructions de petites habitations en GRANDE SÉRIE à des prix très faibles.

Rapidité de construction. — **Très faible pourcentage d'acier.**
Réduction des coffrages. — **Main d'œuvre de montage minime.**
Faible prix de revient du m3 de béton en place.

L'organisation d'**UNE SÉRIE** de constructions à édifier **dans une même région, à périmètre assez vaste,** n'exclut pas les possibilités **d'originalité** et **d'importance** des constructions.

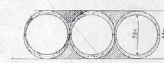
Suivant les désirs, **dans une même série** il peut être prévu **plusieurs types** variant par **leurs dimensions, la disposition des locaux intérieurs, à un ou deux étages, la décoration extérieure;** sans que le **prix de revient au m3 respirable** subisse de ce fait des majorations importantes.

Pour réaliser des constructions plus importantes, il est possible d'arranger les voutains suivant les croquis ci-contre afin d'obtenir des murs plus ou moins épais et plus ou moins résistants.

Piliers formés de voutains doubles.

Pour tous renseignements complémentaires, s'adresser au
Siège Social des Établissements
6, rue de Rome, 6

PLANS ET DEVIS SUR DEMANDE



Mur en voutains doubles.

G. PISSARRO. — PARIS.

Fig. 2-3: Commercial brochure "Établissements Henri Coanda," ca. 1921
Fig. 4-8: House built near Place du Danube building, photographs showing the construction site, 1921

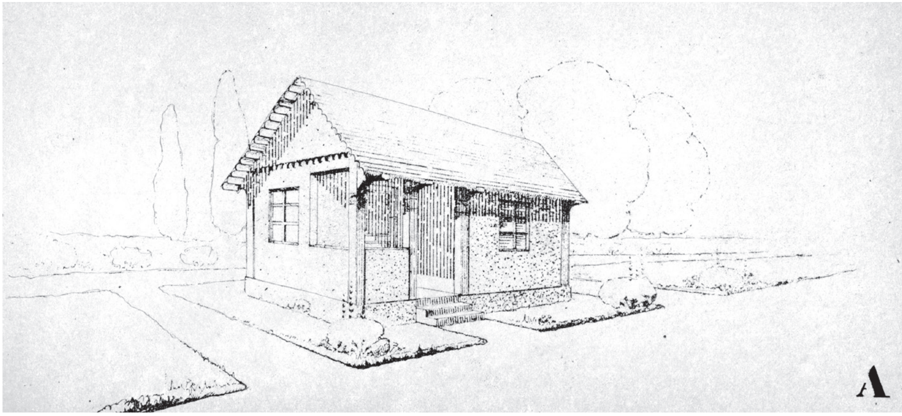


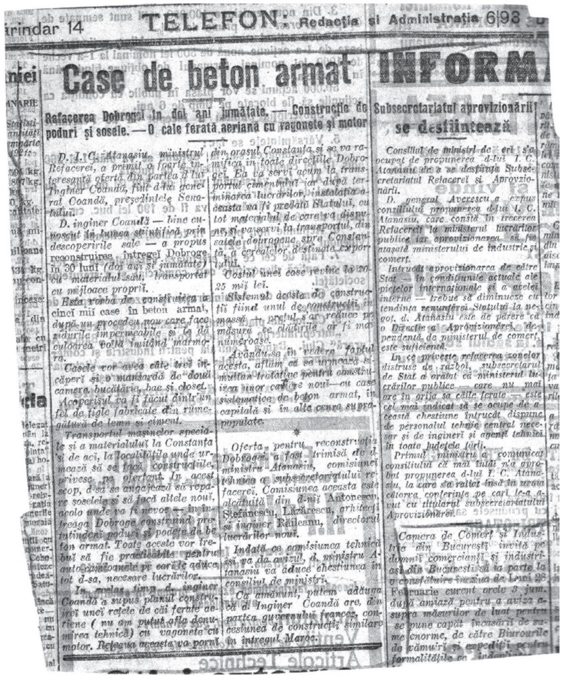
Fig. 9: Commercial brochure "Établissements Henri Coanda / Béton-Granit," 1921

according to the standardized rural house design proposed by the company – type A (Fig. 9). The press enthusiastically hailed this rather utopian proposal, emphasizing that it is a "mass-construction" system: the higher the number of buildings, the lower the price. A cut from one of the newspapers on Sărindari Street from the end of February 1921 has been preserved in the archive (Fig. 10).[16]

In March 1921, the Ministry of Public Works took over the tasks of reconstruction and supply. Subsequently, Coandă conducted negotiations with the *Reconstrucția* Agency, the Commercial Bank, the Romanian Bank and the Romanian Insurance Company *Dacia Română* for establishing the Romanian Limited Company for Exploitation of Henri Coandă Procedures. In June 1921, the company sent commercial offers accompanied by technical specifications to the City Hall of Bucharest (for the construction of 1,000 houses), the Ministry of Public Works (100 houses) and the Ministry of Communications (100 houses for *Casa Muncei C.F.R.*).

At the meetings of July 1 and 5, 1921, the Superior Technical Council of the Ministry of Public Works (M.L.P. – C.T.S.) examined the company's offer to build small economic dwellings using this entirely new system. The Board, chaired by the distinguished civil engineer Elie Radu,

16 "Reinforced Concrete Houses / Reconstruction of Dobrogea in two and a half years. Construction of bridges and roads. A motorised Aerial Cableway with Wagons: Mr. I. C. Atanasiu, minister of Refacere (Recovery) received a very interesting letter from Mr. Coandă, son of General Coandă, President of the Senate. Mr. Coandă – well known in the scientific community for his discoveries – proposed to reconstruct Dobrogea in 30 months (two and a half years) with his own material, transported by his own means. It is about building five thousand houses of reinforced concrete, according to a new building procedure providing waterproof and custom coloured walls. The houses will have three main rooms and a two-room attic, kitchen, bathroom and water closet. The roof will be made of a type of tiles made of sawdust and cement. The transportation of special machinery and materials to Constanța and from here to the localities were the constructions are to be done is assumed by the bidder. To this end, he undertakes to repair roads and make new ones wherever necessary throughout Dobrogea, by building reinforced concrete bridges everywhere. All this will be practicable by trucks, also provided by Mr. Coandă, needed for the works. At the same time he plans to build an aerial way with motor wagons, a network that will start from the city of Constanța and branch in all directions of Dobrogea. Now it will serve for transporting cement, but after the completion of works, this facility will be handed over to the State, and will serve for transportation of cereals to be exported, from Dobrogea villages to the port of Constanța. One house will cost between 20,000-25,000 lei. It is a mass-construction system, the higher the number the buildings, the lower the price. At the same time, we hear that there are ongoing negotiations for the construction of new districts of reinforced concrete houses, in the Capital and in other overcrowded cities. This offer of reconstruction was sent by minister Atanasiu to the Technical Commission of the Sub-secretary of Refacere (Recovery), composed by Ms. Antonescu, Ștefănescu, Lăzărescu, architects and Mr. Răileanu, engineer, the director of the new works. As soon as the Technical Commission gives its favourable opinion, Mr. Atanasiu will raise the issue to the Council of Ministers. We must add that Mr. Coandă received from the French Government a concession for similar constructions in Morocco."



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Case de beton armat

Refacerea Dobrogei în doi ani jumătate. — Construcție de poduri și șosele. — O cale ferată aeriană cu vagonete și motor

D. I. C. Atanasiu, ministrul Refacerei, a primit o foarte interesantă ofertă din partea d-lui Inginer Coandă, fiul d-lui general Coandă, președintele Senatului.

D. inginer Coandă — bine cunoscut în lumea științifică prin descoperirile sale — a propus reconstruirea întregei Dobroge în 30 luni (doi ani și jumătate) cu materialul său, transportat cu mijloace proprii.

Este vorba de construirea a cinci mii case în beton armat, după un procedeu nou care face zidurile impermeabile și le dă culoarea voită imitând marmora.

Casele vor avea câte trei încăperi și o mansardă de două camere, bucătărie, bae și closet.

Acoperișul va fi făcut dintr'un fel de țigle fabricate din rumegătură de lemn și ciment.

Transportul mașinelor speciale și a materialului la Constanța și de aci, la localitățile unde urmează să se facă construcțiile, privesc pe ofertant. In acest scop, d-sa se angajează să repare șoselele și să facă altele noui, acolo unde va fi nevoe — în întreaga Dobroge construind pretutindeni poduri și podețe de beton armat. Toate aceste vor trebui să fie practicabile pentru auto-camioanele pe cari le aduce tot d-sa, necesare lucrărilor.

In acelaș timp d. inginer Coandă a supus planul construirei unei rețele de căi ferate aeriene (nu am putut afla denumirea tehnică) cu vagonete cu motor. Rețeaua aceasta va porni din orașul Constanța și se va ramifica în toate direcțiile Dobrogei. Ea va servi acum la transportul cimentului iar după terminarea lucrărilor, instalația aceasta va fi predată Statului, cu tot materialul de care va dispune, și va servi la transportul, din satele dobrogene spre Constanța, a cerealelor destinate exportului.

Costul unei case revine la 20-25 mii lei.

Sistemul acesta de construcții fiind unul de construcții în massă — prețul s'ar reduce pe măsură ce clădirile ar fi mai numeroase.

Având-se în vedere faptul acesta, aflăm că se urmează simultan tratative pentru construirea unor cartiere noui — cu case sistematice de beton armat, în capitală și în alte centre suprapopulate.

*

Oferta pentru reconstrucția Dobrogei a fost trimisă de d. ministru Atanasiu, comisiunei tehnice a subsecretariatului refacerei. Comisiunea aceasta este alcătuită din d-nii Antonescu, Ștefănescu, Lăzărescu, arhitecți și inginer Răileanu, directorul lucrărilor noui.

Indată ce comisiunea tehnică își va da avizul, d. ministru Atanasiu va aduce chestiunea în consiliul de miniștri.

Ca amănunt, putem adăuga că d. Inginer Coandă are, din partea guvernului francez, concesiunea de construcții similare în întregul Maroc.

INFORM

Subsecretariatul aprovizionării se desființează

Consiliul de miniștri de eri s'a ocupat de propunerea d-lui I. C. Atanasiu de a se desființa Subsecretariatul Refacerei și Aprovizionării.

D. general Averescu a expus consiliului propunerea d-lui I. C. Atanasiu, care constă în trecerea Refacerii la ministerul lucrărilor publice iar aprovizionarea să fie atașată ministerului de industrie și comerț.

Intrucât aprovizionarea de către Stat — în condițiunile actuale ale piețelor internaționale și a acelei interne — trebue să diminueze cu tendința renunțărei Statului la negoț, d. Atanasiu este de părere că o Direcție a Aprovizionărei, dependentă de ministerul de comerț, este suficientă.

In ce privește refacerea zonelor distruse de războî, subsecretarul de Stat a arătat că ministerul lucrărilor publice — care nu mai are în grija sa căile ferate — este cel mai indicat să se ocupe de această chestiune întrucât dispune de personalul tehnic central necesar și de ingineri și agenți tehnici în toate județele țării.

Primul ministru a comunicat consiliului că mai întâi n'a aprobat propunerea d-lui I. C. Atanasiu, la care s'a raliat însă în urma câtorva conferințe pe cari le-a avut cu titularul subsecretariatului Aprovizionărei.

Camera de Comerț și Industrie din București invită pe domnii comercianți și industriași din București să ia parte la o consfătuire în ziua de Luni 28 Februarie curent orele 3 jum. după amiază pentru a aviza asupra măsurilor de luat pentru se pune capăt încasării de sume enorme, de către Biurourile de vămuiri și expediții pentru formalitățile ce [illegible]

Fig. 10: Romanian newspaper cut-out, February 1921

consisted of the most important architects and engineers of the moment.[17] The topic of the debate was the construction of 100 individual housing units in 200 working days, according to the process based on the use of arched reinforced concrete elements of 28 cm inner diameter and 2 cm thickness. The estimated cost per unit was very low: 40,000 lei for a house with two rooms on the ground floor, one room on the first floor and two rooms in the attic, with no basement and no water closet. The Council approved the proposal with some amendments: houses to be provided with deeper foundations (at least 60 cm instead of 25 cm, as offered), cellar, water closet, doors, windows with double glass and wooden floor, without exceeding the amount of 43,000 lei. Then they concluded:

> "If, after the execution of these first houses, it is found that the results are good from a hygienic, economic and aesthetic point of view, the Ministry [of Public Works] will commission the remaining 900 houses specified in the submitted tender."[18]

The available documents prove that one beneficiary of the innovative building method was the newly founded *Casa Muncei C.F.R.*[19]. A number of houses and a school for the children of the railway company employees were built on one of the plots of land allocated to this organization. Unfortunately, the location and the number of the actually erected buildings remain unknown, but we know that dr. Alexandru Costiniu, director of the organization, had witnessed in Paris,

17 Petre Antonescu, R. Baiulescu, S. Carcalechi, N. Cerkez, P. Ciocâlteu, Al. Davidescu, A. Dumitrescu, Duiliu Marcu, G. Panait, G. Popescu, C. Răileanu, T. Sfințescu, N. Vasile-Karpen and I. Zanne – see Central National Historical Archives, M.L.P – C.T.S. Fund, file 60/1921, Journal 92, 1, 5.07.1921.

18 See Central National Historical Archives, M.L.P – C.T.S. Fund, file 60/1921, Journal 92, 1,5.07.1921.

19 Organization protecting employees' rights, established in June 30, 1920, and headed by the senior staff of the Romanian Railway. The organisation took over the housing programme dedicated to Romanian Railroads Company (C.F.R.) employees, carried out before the war by C.F.R. in collaboration with the Communal Society for Low-Cost Housing.

Place du Danube, the construction works of the experimental house.[20] According to a quotation of works for an ongoing building site from April 1923, we know that the cost of a square meter of construction made in conformity with the patented system proved to be 30% lower than the same square meter built in a traditional way. The document also details the construction process and the price for each group of works and specifies the built area (64 sqm) and the number of stories of the building: basement, ground floor, first floor and attic.

A note in Queen Marie's diary, dated December 18, 1923, records that young engineer Coandă, in audience at her Majesty, invited her to the inauguration of a new schoolhouse: "Now he deals with cheap concrete constructions, he even built a school prototype, and he wants me to visit it." Queen Marie did not honour the invitation and there is no other information regarding this experiment.[21]

A second experiment, dating from 1927, is the result of an even more radical approach, involving a fully industrialized process based on the use of a material not specific to architecture, the metal sheet, inspired from the airplane and automobile industry. It was invented and applied in France, where the issue of housing was proclaimed a national priority and where public interventions to stimulate housing construction expanded significantly through the Loucheur Act, of July 13, 1928.[22] The law instituted massive injection of public funds in the construction of low-cost dwellings by providing long-term loans with a low interest rate (2%), encouraging access to property to the neediest classes but also to the lower middle-class. The task was to provide 200,000 low-cost housing units and 60,000 low-rent housing units over a five-year period, with the help of local low-cost housing agencies (HBM – *Habitations à Bon Marché*), municipalities and departments. At the same time, it aimed at helping the steel industry to recover from decline.

Although in the 1920s France was one of the world's largest producer of steel, consumption had begun to decline significantly since the demand for weapons and warships diminished, the railroad network across the country was almost completed, and reinforced concrete was gaining ground over steel in the construction of bridges, viaducts and large structures. In 1929 the professional association O.T.U.A. (*Office Technique pour l'Utilisation de l'Acier*) was established, with the main task of seeking new ways of using steel to increase the demand for this national product. O.T.U.A. launched a real propaganda campaign to stimulate the consumption of steel. One of its main objectives was to encourage construction of metal buildings.[23] The Office supported the effort of private companies that exhibited at the "Foire de Paris," in the spring of 1929, and the first economic houses made of steel, meeting the requirements of the Loucheur Act. As pointed out by Joseph Abram, the metal houses exhibited there would open new ways and would influence the following major endeavor of the Modern Movement to prefabricate architecture.[24]

One of the five prototypes presented at the fair was Coandă's "Multicellular Pavilion." Coandă had filed the patent for a "Building Element" on June 13, 1928. The object of the invention was "a building element which can be utilized for the construction of walls and flooring, and which also lent itself to the erection of complete buildings by convenient assembly of the desired number of units." According to the description, the invention consisted in a construction

20 According to a note from the correspondence preserved in the Coandă archive.

21 See Queen Marie of Romania, *Însemnări zilnice* [*Daily Notes*], vol. V (Bucharest: Historia, 2007).

22 Louis Loucheur (1872-1931), early French technocrat, industrialist and politician, Minister of Labor, Hygiene, Welfare Work and Social Security Provisions.

23 It's worth reminding that Le Corbusier himself developed in 1928/1929 a metallic "Maison Loucheur" – the project remained unbuilt.

24 Joseph Abram, "Les Débuts de l'Industrialisation du Logement (1929-1939): une Utopie Constructive" ["The Beginnings of Housing Industrialization (1929-1939): a Constructive Utopia"], public lecture (Cité de l'Architecture et du Patrimoine, 2007-2008). The five experiments presented at "Foire de Paris" in the spring of 1929 were: the house originated by Forges et Ateliers de Commentry-Oissel, the "Isothermal House" by Raoul Decourt, the house of Forges de Strasbourg, the house proposed by Coandă's "Societé de Constructions Multicellulaires", and the house designed by Ferdinand Fillod's company "Construction Métallique Fillod (COMEFI)."

system based on a hollow building element made of 0.4 mm thick steel sheet, folded in zigzag to constitute a series of triangular prismatic compartments packed side by side in line, formed into a rigid whole. The sheet itself is formed with transverse ribs, for greater rigidity. These elements are then assembled into panels, by means of the shaped flaps along the edges. The module thus created has a section of about 280 x 250 mm and the desired length, for example three meters — the height of one floor. All steel parts forming this sort of tubular lattice girder are joined through on the spot welding. The panels are covered on both sides, in factory, by a continuous insulating layer of 3 mm, a product with a special composition that incorporated a big amount of air. With this, the thickness of the element reaches 340 mm. The panels, tailored in factory to become walls with integrated windows and doors, floors or roofs are ready to be transported to the building site in order to be assembled into complete buildings. Walls and floors are assembled together by gussets and anchors. Wall panels are assembled at the corners by gussets and concrete infilling. In this way, "The Multicellular Constructions" conceived through this method represent a fully industrialized system. (Fig. 11-12)

Coandă had set up the new construction method as early as 1927 and attempted to exploit it commercially in Romania, where housing policies had also evolved. In Romania, the year 1927

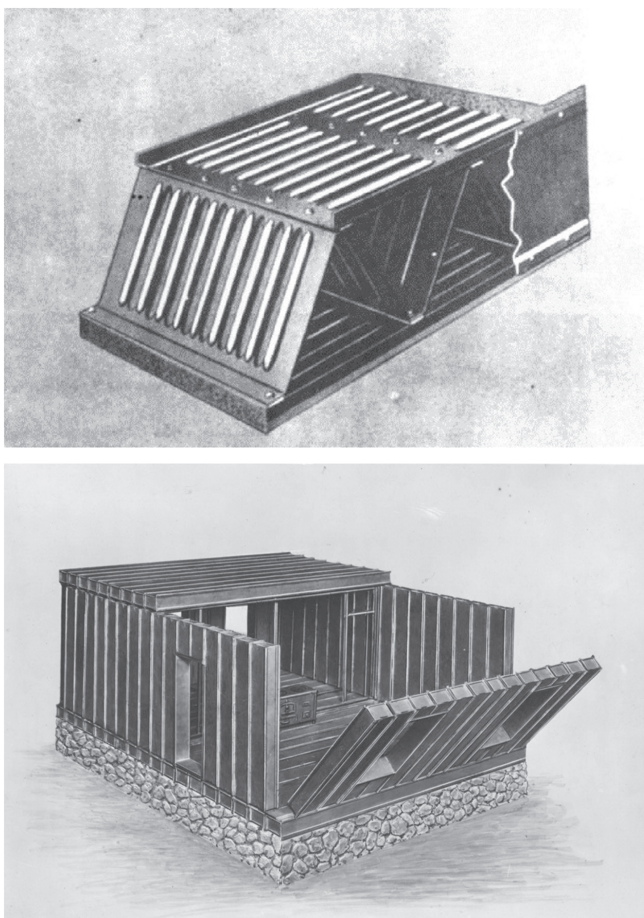

Fig. 11-12: From the French magazine Acier (issued by OTUA: The Technical Office for the Use of Steel), August 1929

marked the introduction of a set of new measures, some of them improving and replacing the ones issued in 1921. Among these, The Law for Encouraging Housing Construction (May 3, 1927) set up financial advantages for the construction of housing, intended for communal societies, construction cooperatives, citizens' associations, etc. The houses were not subject to the rent bill and were partially exempt from global taxes for 15 years.

In a meeting on December 28, 1927, the Superior Technical Council (chaired by the same Elie Radu) examined Coandă's new system and expressed reservations on it, concluding that "it can only be decided on the basis of experience to be undertaken by the tenderer at his own expense."[25] Subsequently, Coandă chose to apply the new building method in France. For immediate exploitation of the patent, in June 1928 he equipped a plant near Saint-Denis (Paris) with special metal sheet forming machines and other equipment needed for the production and assembly of the "multicellular" elements intended for mass-production. They were designed so as to meet the regulations of the Loucheur Act: economic, but provided with all comfort included, at a maximum price of 45,000 francs.[26] The multicellular pavilions were entirely produced in the plant, from raw sheet metal to finished panels of up to 9 m length, with integrated door and window frames, ready to be transported to the building sites and to be mounted on foundations prepared in advance (Fig. 13-15).

Starting with the 1928, the established *Société de Constructions Multicellulaires* presented the multicellular construction system at various competitions and exhibitions and won numerous marks of recognition.[27] The cruciform building (Fig. 16), proposed by the company in collaboration with the French architect J. Dupré in a competition for collective housing organized by the Paris City Hall in November 1928, was one of the five projects shortlisted for execution among the thirteen proposals submitted in the "low-comfort" category.[28] According to the list of awards and distinctions preserved in Coandă's archive, the jury evaluated the project as "exceptional." The projects were presented to the public in February 1929, and the magazine *L'Illustration* published in March 1929 a detailed article featuring the cruciform building (Fig. 17-18).

The project proposed the construction of a 24-story cross-shaped stepped building, entirely made of multicellular elements, on a plot of land in Porte Saint Cloud, in the Bois de Boulogne area. The building, with a total height of 100 m and a base length of 222 m, was to accommodate 700 apartments, 400 garages, schools, dispensaries, a maternity hospital, shops, restaurants, showrooms, etc.; its upper section housed a large water tank for firefighting. Each apartment benefited from a garden terrace. To provide surface protection and a finishing with habitable aspect, the inner faces of the multicellular panels were covered with a specially designed product, a foam composed of sawdust and binder, while for the exteriors, cellulose-based foam, asbestos fibre, silicon, and a binder were used.

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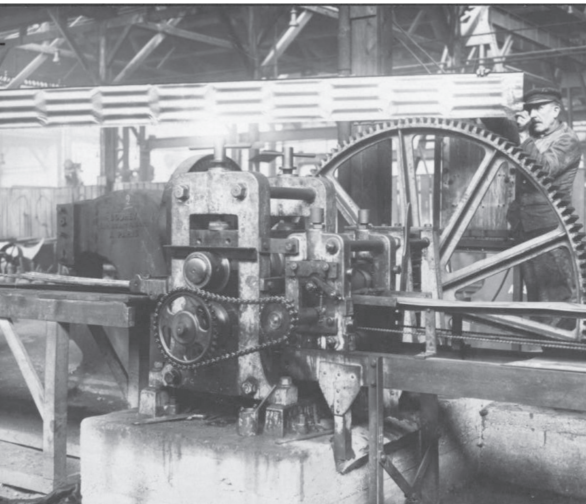
25 See Central National Historical Archives, M.L.P.-C.T.S. Fund, File 387/1927, Protocol 54, 28.12.1927.

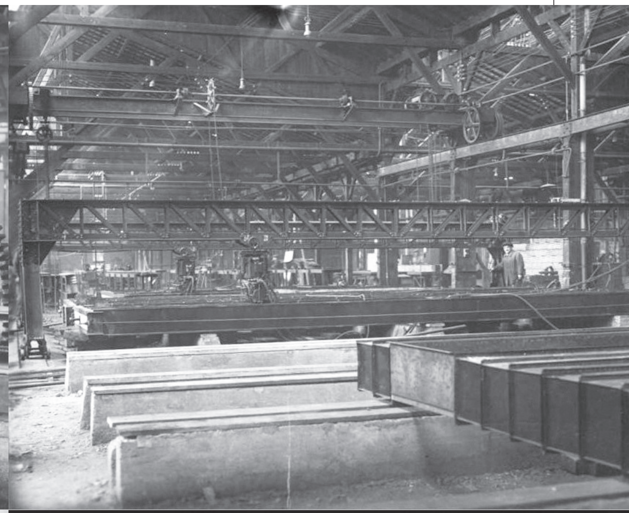
26 In this enterprise, called "Société de Constructions Multicellulaires", Coandă was associated with the French engineer Louis Bourdelles. Together they obtained the technical support of Louis Blériot, (the well-known aviator, inventor and engineer). He also mentions The Romanian architect (and painter) Nicolae Polidor is also mentioned among as collaborators but it is not clear to us in what consisted the young architect's contribution.

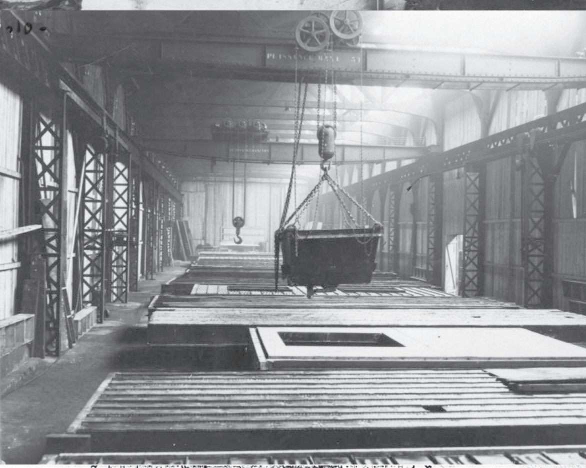
27 According to a list in Coandă's archive: November 1928: "Concours des Immeubles Collectifs de la Ville de Paris" - project selected for execution; February 1929: "Exposition des Bénéficiaires de la Loi Loucheur" - individual house category: Silver Medal, multifamily residential building category: Exceptional; "Exposition de Nice 1929": Gold Medal; "Salon des Artiste Français 1929": Bronze Medal; October-November 1929: "Exposition de l'Habitation": Gold Medal.

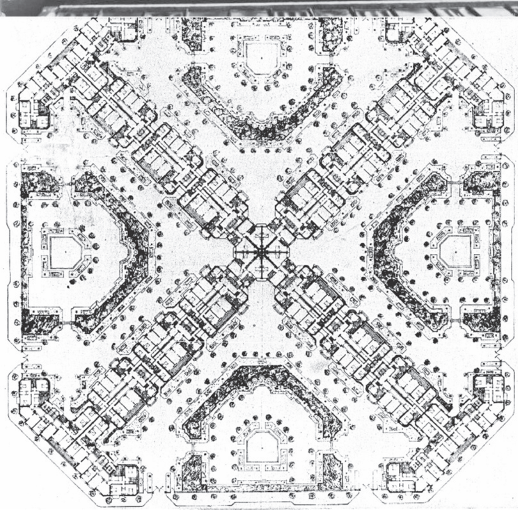
28 The competition entry proposed two categories of dwellings, differentiated by the level of comfort to be achieved: medium and low. A model of Coandă's building is preserved in a storage room at the "Dimitrie Leonida" National Technical Museum in Bucharest.

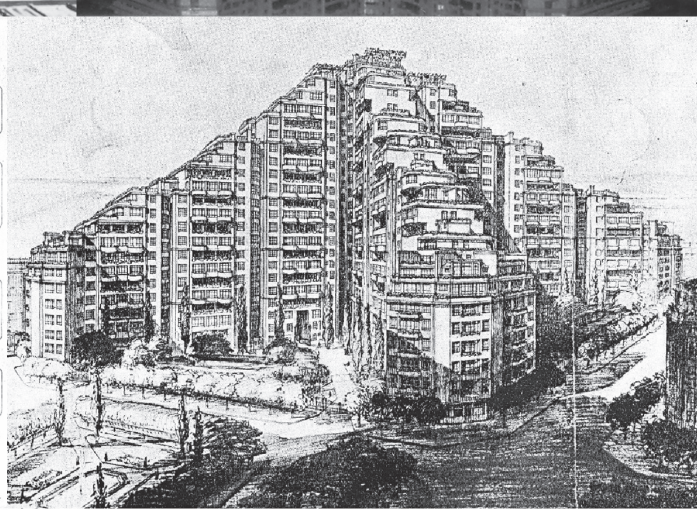
Opposite page:
Fig. 13-15: Photographs showing the production line in Saint-Denis plant, 1929
Fig. 16: Model of the "Cruciform Building"
Fig. 17-18: Plan and perspective of the "Cruciform Building"











Although well-received by the authorities and the general public, the project remained unbuilt. The necessary structural steel frame and the works for the foundations for a 24-storey building would have been too expensive, eventually inconsistent with the requirements of a low-cost housing programme.

In the spring of 1929 the multicellular pavilions, the low-cost metallic houses produced by the Company to meet the requirements of the Loucheur Act, were exhibited at the “Foire de Paris”, the annual event dedicated to the building industry, and in the autumn, to the “Exposition de l’Habitation” held in Paris.

As witnessed by a letter preserved in the archives, signed by the Minister of Labour, Hygiene, Welfare Work and Social Security Provisions, Deputy of Minister Loucheur, the low-cost housing agency HBM commissioned six pavilions type L.3c (with L from Loucheur), to be delivered by August 1929, in various regions of France. (Fig. 19)

The multicellular pavilions were delivered completely finished and equipped with all building services.[29] According to the press, the multicellular pavilions have drawn the attention of the President of the Republic himself, Gaston Doumergue, who “long visited the installations of *Société de Constructions Multicellulaires* and warmly congratulated their inventor, Henri Coandă.”[30]

Despite the fully industrialized production process and the fact that it was based on the multiplication of one single element (the multicellular girder), this construction system was able to generate surprisingly diverse architectural solutions (Fig. 20-22). According to the press, the proposed system has attracted the attention and interest of important clients – HBM offices, large industrial companies, etc.[31] – and was enthusiastically received by both the competent technical bodies and authorities.

The specialized publication *L’Usine* reported on June 7, 1929 that the society had received more than 15,000 requests for homes made at the Saint Denis plant at less than a year after the production started. According to the *La Métallurgie* magazine of June 7, 1929, the plant was equipped so as to reach a production rate of 30 pavilions per day. During a meeting with Minister Loucheur, featured in November 1929 in several publications, Coandă estimated that the production rate at the plant would reach a home at every 12 minutes.

Among the photographs preserved in Coandă’s personal archive we managed to identify one building executed in Rioupéroux (Livet-et-Gavet commune, Isére) in the Rhône-Alpes region (Fig. 23-25), where the assembly steps of the multicellular panels are clearly identifiable.

After 1931 the worldwide economic crisis affected France. The demand for multicellular pavilions gradually declined. The pace of production at Saint-Denis plant slowed to a standstill.

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29 The multicellular pavilions were delivered with doors, windows and partition walls, completely finished and equipped with central heating, hot water, cold water, sewage, electricity, cooking equipment, sanitary ware and fittings. The interior walls were made of steel frames stiffened by “I” profiles. All metal surfaces were coated with anti-corrosion painting. The special layer covering the exterior walls, the floorboards, the partition walls was a specially designed product, a foam perfectly adherent to metallic surfaces, made of silica, barium sulphate, sawdust, magnesia, magnesium oxychloride and antimony, algae colloids. According to their commercial brochure, the dwellings were designed to meet the requirements of “Comité d’Hygiène” regarding the provision of salubrious, “healthy” and “breathable” houses: the panels allowed for air circulation; between the welding points there were spaces which permitted the “ventilation” of the wall, especially its porous cover layer, thus preventing condensation. The walls could “breathe” more or less, if necessary, by the provision of a greater or lesser distance between the welding points. The coating was water-tight but permeable to air.

30 *La Volonté*, November 12, 1929.

31 A list of clients is attached to a commercial offer: Compagnie des Produits Chimique & Electrometallurgique (Péchiney), Compagnie des Chemis de Fer de l’Est, Gillet de Lyon, Société des Produits Chimiques de Clamency, Société des Tannins Belges, H.B.M. De Departement de la Seine, H.B.M. de la Ville de Marseille, H.B.M. du Nord, Travaux Ville de Paris, Société Annemasse Imobilier, Morillon & Corvol, Cooperative de P.L.M., Office cherifien de Maroc.

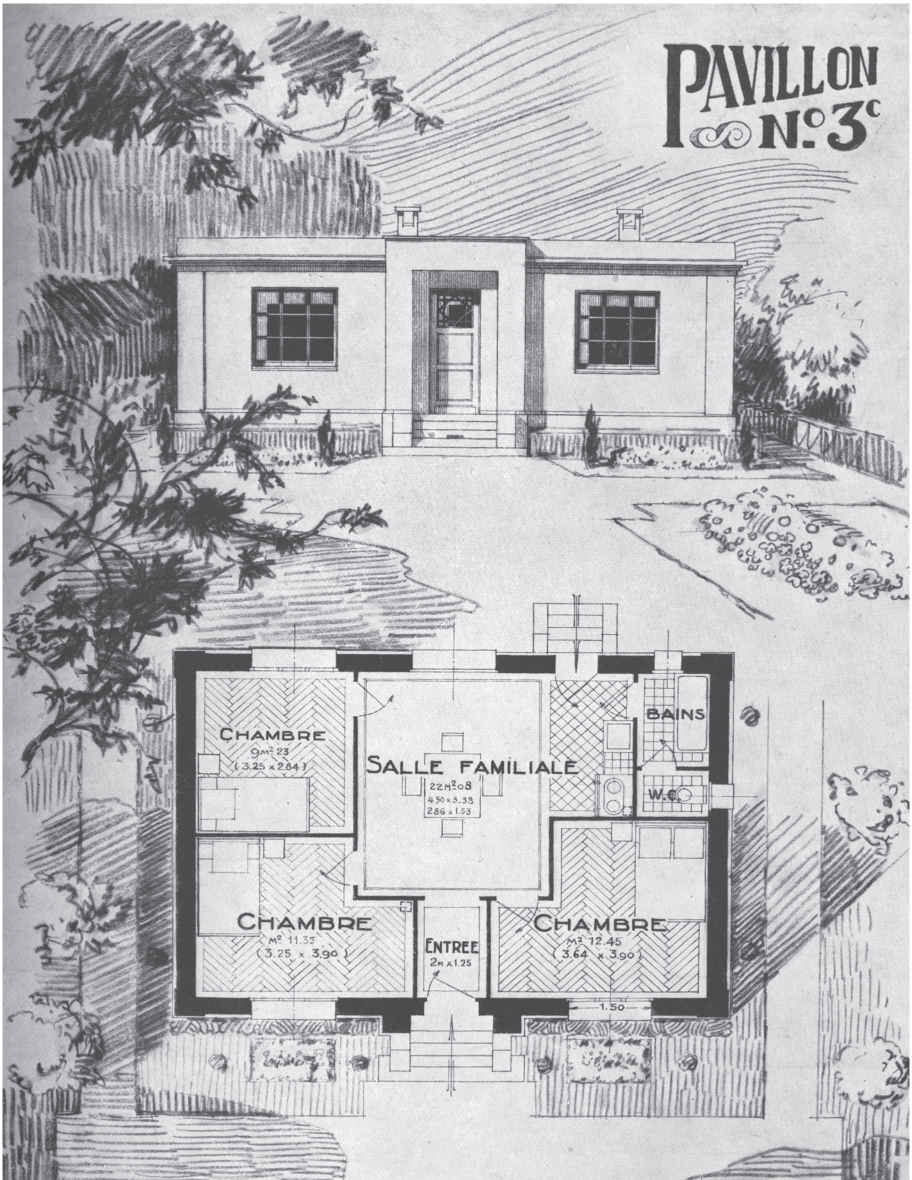

Fig. 19: Pavilion No. 3c, type Loucheur

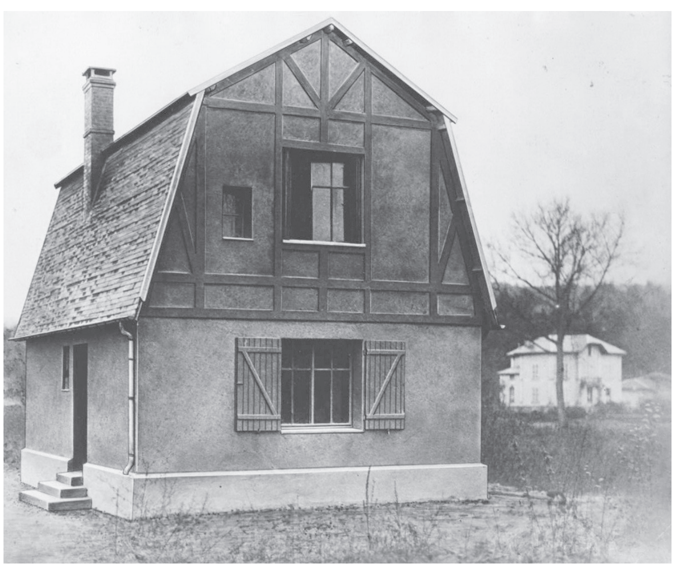

Fig. 20-22: Built “multicellular” pavilions; metallic houses following a rationalist aesthetic or hiding under a traditional appearance

Fig. 23-25: Building in Rioupéroux, photographs showing the construction progress - Livet-et-Gavet, Isére, France

Between France and Romania

As pointed out by architectural historians, the project of prefabricating and industrializing architecture has at the same time technical and political dimensions, and is inextricably linked to utopia.[32] Barry Bergdoll put this in terms of a paradox: despite being commercially ubiquitous, it fails as a utopian ideal.[33] Henri Coandă's prefabricated houses were not an exception, no matter the differences between their relative success in France and relative failure in Romania.

However, it was not utopia which determined the scepticism with which Coandă's prefabricated systems were viewed in Romania, even while in France they enjoyed certain success, or at least inspired certain enthusiasm. The difference between the two responses is even more striking if we take into consideration the fact that both governments were facing significant housing problems and were equally eager to find solutions, and that the problem required similar answers in terms of number, quality, and operational efficiency. Moreover, in Romania, Coandă was, by birth, better connected with the political milieus. This suggests that one must search for subtler reasons, which invoke the professional milieus, their ethos and their relation to the housing policy.

We will certainly highlight here the war economy in the two countries. As Jean-Louis Cohen has pointed out, the radical innovations of modern architecture emerged not only from progressive causes, like social welfare or urban-improvement strategies, but also from the technologies perfected during the two World Wars.[34] While France was developing an impressive war industry, the Romanian army remained all along the conflict under the sign of precariousness and inadequacy in terms of equipment, and its military gear was almost exclusively imported from abroad. The French war industrialists, the builders of airplanes and other combat machines, had to readjust at the end of the war, to find a new social reason for their affairs. They sought to adapt the innovations of war to peace economy and to find new fields of application — housing among others. While in France their efforts benefitted from political backing as well, this kind of industrial immediacy did not exist in post-war Romania.

At the same time, in Western Europe the idea of mass-production of housing began to develop under the influence of some pioneering industrialists, engineers and architects, seduced by the construction methods practiced in the United States, and impressed by the results achieved in the aircraft and automotive industries. Their voice, as Le Corbusier's in *L'Esprit Nouveau*, challenged the classical conception of architecture and acclaimed radical innovations. Although many of their experiments did not go any further than the level of prototype, *l'appel aux industriels* remained critical.[35] The intense activity of the groups of industrialists along with the propagation of Modern Movement ideas managed to shape the public opinion, making it more favourable to this type of experiments.

Henri Coandă belonged to the progressive circles in France; he collaborated during the war with Louis Blériot and other aircraft engineers, benefited from the support of Gustave Eiffel and gained the trust of important statesmen like Alexandre Ribot or Paul Peinlevé. In Romania, the son of General Coandă was also well-known in the high society and the politically influential circles, but his radical construction methods were singular, even exotic, thus not really attractive or trustworthy, no matter how efficient their results would have been.

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32 See for example Antoine Picon, "Industrialisation of the Building: a Technical and Political Project," in Franz Graf and Yvan Delemontey, *Architecture industrialisée et prefabriquée: Connaisance et sauvegarde / Understanding and conserving - Industrialized and prefabricated architecture* (Lausanne: PPUR, 2012).

33 Barry Bergdoll and Peter Christensen, *Home Delivery: Fabricating the Modern Dwelling* (New York: The Museum of Modern Art, 2008).

34 Jean-Louis Cohen, *Architecture in Uniform: Designing and Building for the Second World War* (Montréal: Canadian Centre for Architecture, 2011).

35 In 1914, Le Corbusier had already developed, in response to the immense devastation of the first months of war, the *Dom-ino* system, one of the earliest applications of mass-production techniques to housing.

This was not only because his prefabricated systems were based on the use of precast concrete or steel – building materials less frequently used in Romanian domestic architecture.[36] The professional attitude towards concrete was also different in the two countries. In France, the modern construction professionals (architects, civil engineers and entrepreneurs) - working in a society that had already established specific regulations, mature systems of education, in a climate of stimulating creativity and competitiveness - adopted a more experimental approach to the use of reinforced concrete than in other countries.[37] From the encounter between technical innovation and entrepreneurial intelligence emerged construction systems aiming to mass-produce buildings, "maybe the major utopian venture of the 20th century."[38] Apart from the "pioneers", architects did not adhere spontaneously to the architecture of social housing.[39] This new programme was not based on previous models and required unprecedented architectural offers, new typologies and forms, for which most of the architects were ill prepared. The industrialization of architecture was mostly assumed by engineers, who had taken up the new ideology of production – building better, faster and cheaper.

In Romania both engineers and institutionally trained architects were younger professional categories.[40] They were as young as the whole modernization process whose offshoots they were, and in which they were summoned to participate. For different reasons, Coandă's innovations, which were perfectly fit in Western professional environments, were not in tune with the ideology of either engineers, or architects. The construction rhythm required by the accelerated modernization process imposed the use of reinforced concrete, and Romanian civil engineers could not afford experiments, all the more so since, at the time, there was no proper laboratory to test the resistance and behaviour of this material.[41] They generally maintained a more reserved attitude and preferred to follow mathematical grounded methods of calculation already verified, not to test original, new approaches. From this perspective, although the engineers played a crucial role in the debate for the low-cost housing production, they were not really comfortable with Coandă's experiments.

On their hand, Romanian architects were equally uncomfortable with Coandă's patents. The main task they assumed was to give a national expression to the new modern state, which in 1918 reached its largest geographical extent, after the incorporation of Transylvania, Bucovina and Bessarabia. This ideologically-charged, ultimately political task directed the architectural debate towards aesthetic matters. The search for a national style, a constant concern since the end of the 19th century, developed in the context of a professional culture based on importats and eventually acquired sharp conflictual dimensions when clashing with progressive modernist ideas in the interwar period. As the professional literature hints, these issues were more important to architects than housing problems, in general, and housing experiments in particular.

Consequently, the necessary social housing reform, which was enforced by political will, was characterized by a continuous dispute between engineers and architects. Symptomatically, the Romanian Society of Architects refused to participate in the competition for the design of low-

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36 In Romania, both precast concrete and steel had been used in industrial constructions and bridge building, starting at the end of 19th century (by the renowned engineer Anghel Saligny).

37 In Germany, Austria and Switzerland official circulars with norms of calculation of reinforced concrete were established in 1907. In France these were issued since1906 as general prescriptions, leaving a certain amount of freedom to the engineers.

38 Jean-Louis Cohen, "Modern Architecture and the Saga of Concrete," in *Liquid Stone / New Architecture in Concrete. Modern Architecture and the Saga of Concrete*, eds. Jean-Louis Cohen and G. Martin Moeller, Jr. (New York: Princeton Architectural Press, 2011).

39 Gerard Monnier, "Le logement social et son architecture en France: histoire et reception" ["Social Housing and its Architecture in France"], conference, Ecole d'Architecture de Paris-Belleville, 11.04.1998.

40 The foundation of Romanian higher technical education was laid in 1881, when engineer Gh. Duca was appointed to the leadership of National School of Bridges and Roads. The first important professional association, the Polytechnic Society, was also founded in 1881.The School of Architecture was founded in 1892 by the Society of Architects (born in1891) on a model inspired by the Ecole des Beaux-Arts in Paris.

41 A. Ioanovici, "Istoricul desvoltărei tehnice a betonului armat în România" ("The History of Technical Development of Reinforced Concrete in Romania"), *Buletinul Societății Politecnice* 1931: 1212-1229.

cost housing in 1910, considering that this was below the professional dignity of an architect. The housing reform was coordinated at its beginnings by engineers Cincinat Sfinţescu and Andrei G. Ioachimescu.[42] However, for their own reasons, engineers and architects alike have not regarded low-cost housing programmes as occasions to innovate, nor were they seduced by prefabrication. Although well-informed about the experiments on both sides of Atlantic,[43] they resisted such an approach, preferring traditional building solutions to new ones.

Innovation was however accepted (and put into practice) unless it did not disturb too much the habits or the national expression. As relevant proof for this conservative attitude stands Coandă's patent of invention for a new material imitating oak wood, the "concrete-wood" – "a stunt of a new genre," as its inventor called it.[44] It was successfully applied to some important edifices where he collaborated with renowned architects as Ion D. Berindey and Edmond Van Saanen Algi, in Iași and Bucharest. The only one still standing is the Palace of Culture in Iași (completed in 1925), where Coandă decorated some of the main halls with "concrete-wood" panels, designed by himself, as he studied sculpture with Auguste Rodin in 1902.[45] This suggests that the Romanian conservative architectural elite was willing to adopt some innovation as long as hidden under the coat of tradition.

Last but not least, another possible explanation for Coandă's lack of success in applying his prefabrication and industrialization methods in Romania regards the implementation of the Romanian housing Reform. Recent research has shown that the social objectives of the reformist housing policy were not in fact not achieved, and that the dwellings built by means of successive regulations were more likely distributed among the superior staff of public institutions.[46]

If this is the case, maybe the "economic" houses proposed by Coandă were in fact too humble for this hidden agenda.

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Political ideology affected Coandă's innovative systems of prefabricated dwellings again, this time after the Second World War, when official history during Communism claimed that prefabrication and industrialization in the field of construction were first introduced in Romania in August 1949 by "a group of technicians of Trust No. 5 of M.C.I.M.C. in Brașov, who had planned to study the new methods of work successfully applied in the Soviet Union."[47]

We do not know if the omission of Coandă's experiments from the later Romanian historiography of architecture and construction techniques was due to political censorship, or if it was only a matter of professional carelessness.[48] Although missing from this "official history," they were interesting contributions to the history of Romanian modernism: at a time when the architectural

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42 See Andrei Răzvan Voinea and Dana Dolghin, "Politica de locuire și realizările sale: proiectele sociale în București 1906-1946" ["Housing policy and its achievements: social projects in Bucharest – 1906-1946"], https://atelier.liternet.ro/articol/14658/Razvan-Voinea-Dana-Dolghin/Politica-de-locuire-si-realizarile-sale-proiectele-sociale-in-Bucuresti-1906-1946.html, last accessed 1.10.2018.

43 Both specialized publications (such as *Buletinul Societății Politecnice* [*The Bulletin of the Polytechnic Society*]) and daily press were popularizing the American technological advances, the theories of Scientific Management and also their European replicas.

44 Romanian Patent No. 10620, July 11, 1924: "Procedure for obtaining wood and marble imitation."

45 In 1902 Coandă had studied sculpture in the studio of Auguste Rodin. Among the other buildings we found in Coandă's recordings: Shopping windows on Calea Victoriei and the "House of Antiquarians", edifice designed in 1924, in the homonymous square, by the architect Edmond Van Saanen Algi, and demolished in 1943. See Firoiu, *Din nou acasă*.

46 Voinea, Dolghin, "Politica de locuire."

47 Central National Historical Archives, The Council of Ministers Fund, file 715/1952.

48 In his *Reinforced Concrete in Romania*, Emil Prager (renowned Romanian civil engineer) mentions the patent based on precast concrete elements, without specifying its inventor, although the bibliography at the end of the volume includes a document named "Henri Coandă Procedures and Patents, 1923." See Emil Prager, *Betonul armat* în *România* [*Reinforced Concrete in Romania*], vol. 1 (Bucharest: Editura Tehnică, 1979).

debates were predominantly stylistic, Coandă's patents were acutely modern, operating with modules, standard elements, rationalization, prefabrication, mass-production of houses, and resorting to novel uses of concrete and steel. They are all the more important for this history not because of their obvious technical and architectural interest, but precisely because of the local reluctance they met, which transformed them in accidents, moments when the pragmatic political receptiveness was not enough.

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Fig. 1-10, 13-15, 19-25: National Museum of Romanian Aviation: Henri Coandă Archive

Fig. 11-12: *Acier* (August 1929)

Fig. 16: „Dimitrie Leonida" National Technical Museum, Bucharest

Fig. 17-18: *L'Illustration* (March 1929)