

Consulting Engineer

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Cornell, Howland,
Hayes & Merryfield
(Counterclockwise from top)

Joint leadership for
a progressive firm.

Page 108

Photo by Ball of Corvallis



Howland's responsibilities and duties as general manager leaves little time for engineering. McLain Fisher, left, administrative assistant, handles some of the details, allowing Howland to participate in hydraulics and harbor design.

CH₂M—Four Men Head a Growing Firm

Cornell, Howland, Hayes & Merryfield — now formally CH₂M, Inc. — in 23 years has grown from its original 4 founders to the largest completely integrated engineering and planning organization in the Pacific Northwest, ranking 79th in 1967 on *Engineering News-Record's* list of the top 500 design firms. Yet to the visitor this rate of growth and the continuing diversification of technical capabilities seem overshadowed by the philosophies and character of the firm itself. One gets the impression CH₂M is a big family whose members all are completely permeated with the imagination, enthusiasm, and drive of its founders.

The close friendships among Holly A. Cornell, James C. Howland, Thomas B. Hayes, and Fred Merryfield actually began when Cornell, Howland, and Hayes were classmates at Oregon State University, where Fred Merryfield was professor of civil engineering. Following graduation in 1938, Cornell went on to Yale University for his M. Eng., structural engineering, and

then into military service. Hayes earned his MS, EE at MIT, worked for Jackson & Moreland, of Boston, and W. R. Holway & Associates, of Tulsa, and served in the military. Howland received his MS, CE at MIT, served as design engineer at Standard Oil Company of California, and also entered the armed forces. Yet throughout these diverse activities, all four men remained in contact, probably without realizing that one day they all would wind up back together in Corvallis, Oregon.

When Cornell completed his service obligation in 1945 and returned to Corvallis, he found Fred Merryfield still teaching but also doing part-time consulting (Merryfield earned his MS, sanitary engineering, at the University of North Carolina). It seems the Oregon State Sanitary Authority had ordered a cleanup of pollution in the Willamette River Valley, and the result was more sewage and water treatment plant work than Merryfield could handle. Cornell set up a drafting board in his bedroom to handle the overflow, with the

understanding that Howland and Hayes would join the others when they completed their military service. In 1946, a young firm with a built in demand for its services was born.

From this humble beginning grew the firm of some 270 people that now offers a complete engineering service in the civil, electrical, mechanical, and chemical fields, and a comprehensive planning service including urban and regional planning, economic investigations, and resource studies. Engineering analysis and design projects include airport runways and facilities; electric, electronic, and hydraulic controls; electric power systems and stations; harbors and port facilities; heating, ventilating, and air conditioning systems; highways, streets, and bridges; industrial plants and processes; steam and hydroelectric power plants; structures and foundations; water reclamation; and water, sewer, and gas systems. The CH₂M urban and regional planning division has handled comprehensive plans, land development, specialized studies, and urban renewal. Among its supplementary and special services are appraisals and valuations, economic investigations, feasibility studies, inspection and construction supervision and management, operating manuals, prospectus preparation, rate investigations, research and development, specification writing, and testing.

How CH₂M was able to attain this diversification and expand geographically is explained, in part, in the accompanying table giving a brief outline of the firm's history. Inspection of these pertinent items shows that at all times the principals were aware of the over-all big picture, but they also kept track of the small details — even modest purchases of capital equipment — and paid close attention to procedural methods and, above all, to human relations. To do this, the principals realized early in their practice that they would have to handle personally the management functions and recognize that consulting engineering is a business.

In the present corporate structure, Jim Howland serves as president and has been general manager for almost the entire life of the firm. As he puts it, "When we started out we all wanted to do engineering. I personally believe that anything you do should be fun. No, that's the wrong word. I believe everyone must enjoy what he is doing, or he would be better off doing something else. Still, even providing a professional service is a business that must return rewards to the participants, and this takes management. We always have tried as we have grown to surround ourselves with technically competent people, but even more importantly people who are idealistically and temperamentally suited to our operation. In short, we want to be successful, but we want to do it with nice guys."

Keeping the firm supplied with nice guys is the job of staff manager Fred Merryfield. He says, "With respect to technical qualifications, we do not have a fixed formula, but if you are talking about engineering

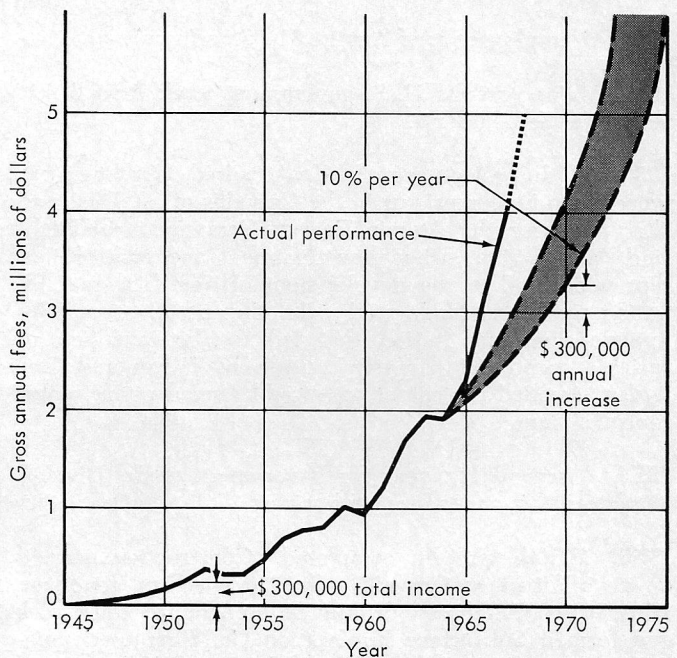
school graduates, I would look basically for individuals well grounded in mathematics, physics, and English. We do not share the views of some of the top industrial companies that demand that a man be in the top 10 percent of his class, or a Tau Beta Pi, or some other restriction as a condition of employment. We are more interested in what his attitudes are and how will he fit into our organization.

"It is getting to a point where we should be trying to reach youngsters 9 and 10 years old. If you wait until they are seniors in college, you find the student evaluating a dozen competitive job offers and then it is too late. We like people who welcome opportunity and responsibility, and we try to see that our firm provides room for growth. We try to make maximum use of our staff's talents and stress the importance of both line and staff functions.

"There are advantages to having offices located in university cities. The intellectual climate is always attractive to professional people. It facilitates staff advancement, in that our people can take additional courses at the University, and we can arrange for faculty members to conduct special seminars for our staff."

To which Jim Howland added, "I think you could best say that we view our people on a total man basis. We want our people to grow and to have the opportunity to grow. That is the only way that you can assure continuity of an organization, and we recognize that we have to pay the competitive rates of the particular areas involved. We also sweeten it with a profit-sharing plan and bonus system."

Planning ahead for an adequate volume of work to sustain a growing organization is the responsibility of



Goal of CH₂M is to grow at least 10 percent annually.

Burke Hayes, business development director, who also doubles as project manager for electrical projects in the Corvallis office. Hayes says, "I think it would be more accurate to say that mine is a growth planning function rather than a business development function *per se*. There are a number of ways one can grow, the

most obvious, of course, being adding services or expanding geographically. We have done both.

"Basically each office is headed by an area manager. Each office is set up in divisions by types of projects, each headed by a project manager, and the project managers themselves handle the direct business de-

Outline of CH₂M History

1945-47. Holly A. Cornell arrived in Corvallis and with Fred Merryfield started the business which was planned to include James C. Howland and Thomas B. Hayes. By 1946 opened offices (2 rooms) in the Smith Building. Howland arrived early in January, and Hayes a month later. The full name of Cornell, Howland, Hayes & Merryfield was adopted and the professional partnership formed. In August, moved to larger offices in the Rennie Building, and spent \$1126 in time and materials fixing up new space - 1519 sq ft.

1948. Ralph E. Roderick and Archie H. Rice became partners.

1949. 200th project completed. Purchased property at 1600 Western Avenue, Corvallis, and designed and started construction on office building.

1950. Moved into the new 3500-sq ft company owned building in February. Opened Boise, Idaho, office in August with E. C. Reynolds, Jr. as engineer in charge. Adopted support drawing file system using shelf bracket runners and Acco fasteners. Adopted monogram CH₂M (opinions differ as to who thought it up first, one of the clients, Hugh Curran, chief engineer of the Eugene Water & Electric Board, who claimed the full name was too unwieldy, or Archie Rice, while playing the waterdog - H₂OK₉ - game).

1951. 41 employees as of August 31 (6 partners).

1952. Major year for U. S. government work. Issued first newsletter September 6.

1953. 500th project completed. Acquired first ammonia process continuous printer in the Corvallis office. Designed filter plant for the Atomic Energy Commission at Richland, Washington, using new treatment and control concept which led to the development of new high-rate filtration processes. Made studies on Eugene, Oregon, 13th Avenue Pumping Station that led to the invention of variable speed pump motor controls by Hayes and Carl Ryden. Applied for patent on variable speed pump motor control system.

1954. A second big year for government work. Divided Northwest into zones for new business.

1955. 1000th project completed. Construction started on an addition to Corvallis office; opened an annex on 15th Street. Purchased drilling equipment for soils work and formed Subsurface Exploration Co. First used polaroid camera for survey work. Fred Merryfield appointed

by Oregon Governor Paul Patterson to the new State Water Resources Board.

1956. Reached 100 persons on payroll, and went from 44-hour to 40-hour week. Set up service departments in Corvallis office (these currently include drafting and surveying, estimating, library, printing, resident engineering, secretarial, soils laboratory, and specifications). Established library cataloging system. Formed Advisory Committee. Formed Flying Club and obtained three leased pool cars.

1957. 1500th project completed. Purchased multilith equipment, and installed central dictation in Corvallis office. Variable speed pump devise went on sale; General Services Co. formed. Started weekly newsletters. Set up medical and hospital coverage for employees and formed credit union. Used digital computer on water grid analysis. Fred Merryfield became national president of the American Water Works Association; Holly Cornell president of the Pacific Northwest Council of ASCE.

1958. Built second addition to Corvallis office, and built and equipped a soils lab. Started weekly information sessions 4:30 p.m. to 6:00 p.m. Holly Cornell president of CEC/Oregon.

1959. 2000th project completed. Air conditioned the Corvallis office and installed ADT and a Western Union terminal. Used first machine payroll processing (service bureau) and adopted payroll x 2 for standard rate. Started a profit sharing and retirement plan, and took out major medical and salary continuation insurance. As a result of helping after the Roseburg explosion disaster, Howland organized, through CEC/Oregon, an engineering organization for future disaster relief in Oregon.

1960. E. C. Reynolds, Jr. made a partner. Seattle office opened by Holly Cornell, Jim Poirot, and Leslie Elliott, soon joined by Oscar Frial. Purchased land for Boise office building. Flying Club acquired Mooney Airplane. Pioneered use of air photos as "plan" for pipeline plan and profile sheets. Summer English class held in Corvallis office with Dr. Frank Ligon of OSU as instructor.

1961. Bob Adams, Wayne Phillips, and Sid Lasswell named partners. Booz-Allen-Hamilton made management study of firm resulting in reorganization with Fred Merryfield as staff manager. Engaged John Denny as PR consultant. Boise office building opened, and Xerox machine installed in Corvallis office. Profit sharing and retirement plan approved by IRS. Fred Merryfield named as director of the International Water Supply Association representing U. S. Water Works Groups. Bob Adams elected

velopment contacts for their particular project area. Back in 1964, we plotted a chart showing the goals of CH₂M (see illustration). Along with it we noted that in 19 years, CH₂M had grown from an idea to a firm of 140 people doing approximately \$1.9 million worth of business per year, a growth of approximately 14 per-

cent per year compounded annually. When the chart was prepared we decided that to provide adequate horizons for our people, two goals had to be adopted by management: to be a major factor in world-wide engineering and planning; and to grow at a minimum rate of 10 percent per year. We stated that to reach

Outline of CH₂M History

to serve as the president of the Structural Engineers Association of Oregon.

1962. 2500th project completed. Bill Watters and Fred Harem named partners; Ken Bielman named manager of technical services in Corvallis office. By June, total staff reached 130 full and part-time people. Seattle office moved into larger quarters; Corvallis building again expanded — by ½. Added varityper in Corvallis office and automatic telephone system. Hayes appointed by Oregon Governor Mark Hatfield to advisory committee to study economic and engineering ramifications of Bonneville Power Administration proposed California power intertie.

1963. 3000th project completed. Added 17 feet on back of Boise building; 2-story, 5000-sq ft addition at Corvallis. Acquired ½ block across Western Avenue for possible future expansion. Converted mailing list to computerized system, and started quarterly newsletter for outside distribution. Archie Rice first consulting engineer to serve as chairman of Pacific Northwest Section of AWWA.

1964. Opened Portland office with Lloyd Anderson as manager and director of planning. Urban and regional planning added to the firm's services. Installed IBM accounting equipment and a process camera and darkroom in Corvallis office. Arranged for tie-line telephone between Corvallis and Portland, with tie-line between Portland and Seattle. Roderick went to Costa Rica on "04" mission, and also became president of the Pacific Northwest Section of the Water Pollution Control Federation. Bob Adams named chairman of the Western States Conference of Structural Engineers Associations.

1965. 3500th project completed in January; 4000th project completed in November. Ralph Roderick named Corvallis office manager, and firm had its first husband-wife engineer team, Rochelle and Roger Dolan. Portland office moved from 5th to 11th floor of Executive Building. General Services Company building constructed at Corvallis Airport Industrial Park. General Services Co. sold to Neptune Meter Co. Holly Cornell became president of the Seattle Section of ASCE, and Jim Howland president of CEC/Oregon. An Oregon chapter of the American Society of Certified Engineering Technicians was formed in Corvallis with Harry Teel as president, and Teel also named president of the Benton County YMCA.

1966. Staff reached 200 mark. CH₂M became a corporation; new stockholders — Lloyd Anderson, Ken Bielman, Russ Culp, Austin Evanson, Dale King, LaMont Matthews, Harry Mejdell, Dick Nichols, Bob Pailthorp, Jim Poirot, Joe Purviance, Carl Ryden, Vaughn Sterling, Roy Taylor,

and Les Wierson. Kathy Phillips Ritter first lady draftsman, and Les Wierson heads engineering in Portland office. Subsurface Exploration Co. changed to CH₂M Industries, which is wholly owned by CH₂M. Boise office expanded, \$28,890. Two trailers moved in to provide more Corvallis office space. Vancouver, Washington, office opened with Gordon Elliott in charge. Automatic collating machine installed in Corvallis print shop, and first IBM MT/ST (magnetic tape/"Selectric" typewriter) acquired. Specifications go to CSI format and master specifications start to be put on MT/ST tape. Fred Merryfield named Engineer of the Year by the Professional Engineers of Oregon, and also attended International Water Supply Association meeting in Barcelona, Spain. Bob Adams named president of the Oregon Section of ASCE, and Ed Greey became Life Member of ASCE. Mac Stuart elected president of the Oregon Section of ASCET. Harry Teel elected to Corvallis City Council; Howland named to Planning Commission; Lloyd Anderson chairman of the Multnomah County Charter Committee. CH₂M-designed tertiary treatment plant at Lake Tahoe tied for first place in CEC/Oregon Design Competition.

1967. 4500th project completed. Staff passed 250 mark. CH₂M ranked 79th in *Engineering News-Record's* listing of the Top 500 Design Firms. Wayne Phillips became mechanical projects manager and T. B. Hayes electrical projects manager in Corvallis. New wing added to Corvallis office bringing total to 30,000 square feet. Bought property in Corvallis and traded the ½ block of Western Avenue purchased in 1963 to OSU for land in back of CH₂M building. Seattle and Portland offices expanded. Installed computer terminals in Corvallis, Vancouver, and Seattle offices and formed Data Processing Guidance Committee. Published interim edition of *Policy and Procedures Book*. Jim Howland on national board of directors of CEC; N. B. Nordquist on national board of trustees of ICET; Holly Cornell a member of AWWA's national technical and professional committee on engineering and construction; R. L. Chapman chairman of the Purification Division of AWWA; and S. S. Lasswell serving on national committee of WPCF. Artist drawing of Earl Reynolds in Boise paper with caption "Portrait of a Distinguished Citizen." Holly Cornell and Fred Harem receive AWWA Distribution Division Award in Atlantic City for paper, "Design of Circular Prestressed Concrete Tanks." International grand award for engineering excellence received from Consulting Engineers Council/USA for Lake Tahoe water reclamation plant. Salmon Harbor Project at Winchester Bay wins CEC/Oregon 1967 Design Competition (1 of 3 winners).

1968. 5000th project completed.

the goals set would require great effort and constant attention to new business opportunities throughout the world, and all work would have to be imaginative and of the highest quality. The staff then would have opportunities to extend their endeavors and new people with special experience would be added.

"Actually, for each of the last four years we have considerably exceeded these goals. I think we have the courage to continue to do so. You hear some consulting firms worrying about independent practices being absorbed by conglomerates or merging with other firms, but I believe we must be realistic about any form of competition. Certainly the turnkey project is not going to go away; it may even have application in some types of public works projects. But I think you can always get your share of the business if you can provide a highly professional service."

That CH₂M intends to do. This is amply demonstrated by Holly A. Cornell, who serves as director of

advanced planning as well as engineering production manager. For the past year Cornell has devoted nearly all of his time to an engineering production study aimed at determining what direction engineering practice will take in the future.

Cornell summarizes it this way. "The objective of the study is to develop methods to improve the efficiency and technical excellence of the services CH₂M provides, and, at the same time, provide a challenge to its people and give them a sense of real accomplishment. We hope to materially reduce the amount of routine work now required of all personnel, not just the engineers, by the application of modern technology. Although the computer is one of the major tools, many others are available, such as: automated specifications, digitizing, machine plotting, detail standardization, combining reproduction and drafting procedures, automation of all repetitive type tasks from preparation of engineering contracts to final payment estimates, the application of advanced methods of analysis, operations research, and management theory. A revolutionary change in the organization and procedure has not appeared, but when all the improvements suggested are combined into an integrated system, the result may seem revolutionary to some.

"The direction engineering practice will take does not seem difficult to foresee. In their internal operations, engineers will do less routine computation work. Procedures that have heretofore been called design, but can be reduced to a set of logical rules, will no longer be performed by an engineer, but by a skilled technician utilizing computer programs, automatic digitizing equipment, photographic and photogrammetric methods, and all other current, and yet to appear, technical developments. The engineer will thus have greatly improved and sophisticated problem solving tools. He will become distinctly a problem solver and solution finder, and the detailed implementation of his solution will evolve into a production operation."

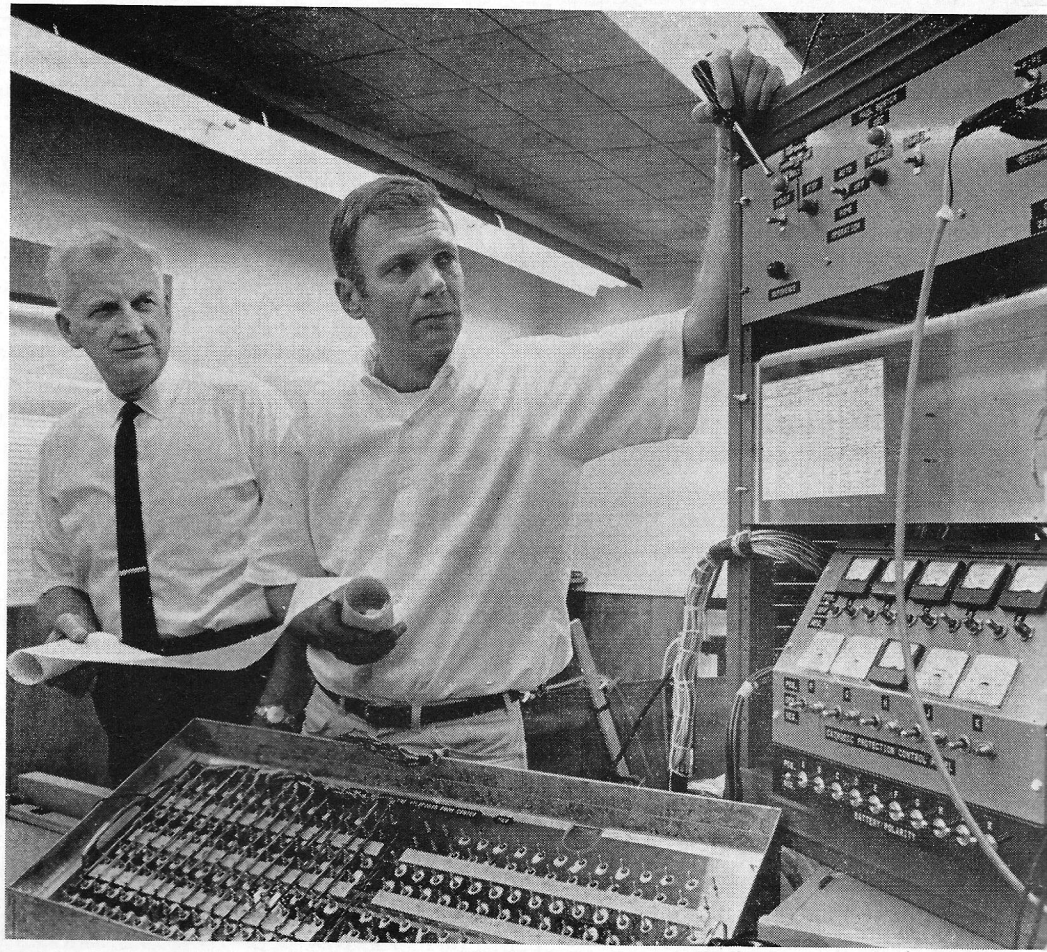
CH₂M's problem solving in the past already has led to some interesting developments. In 1953 the firm designed a filter plant for the Atomic Energy Commission, at Richland, Washington, using new treatment and control concepts that led to the development of now patented high-rate filtration processes. The same year studies on the Eugene, Oregon, 13th Avenue Pumping Station led to the invention of variable speed pump motor controls by Burke Hayes and Carl Ryden, also later patented. These innovations resulted in the formation of manufacturing subsidiaries to CH₂M so the developments would become generally available for application by other firms.

When asked what complications patenting and manufacturing products has for a consulting firm, Jim Howland had this to say. "We believe one of the basic duties of a consulting engineering practice is to innovate. If we can develop a better way of doing some-



Cornell's main assignment is the application of new technology to improvement of engineering techniques and methods. Here Cornell (standing) and Ken Van Dusen check data coming in by teletype from a computer in Seattle. Each CH₂M office is connected by teletype to the computer.

Burke Hayes, left, head of CH₂M's business development and projects manager of its electrical section, and William R. Shrader, electrical engineer, examine a model, designed and built by the firm, of a simulated underground pipeline which is subject to corrosion by stray currents. Equipment is being used in a study for a committee of industries which make extensive use of underground systems.



As staff manager, Fred Merryfield handles the assignment of staff and the selection of new staff members. CH₂M attracts young engineers like Richard S. Reid, ME, by offering the opportunity to assume responsibility.



thing than the conventional way it is being done, or a new method that would also have application for other types of projects than the one for which it was originally developed, then we think it should be made available to everybody. In our particular experience, it seemed that the only way we could make these developments available was to go ahead and produce them. We did not handle the sales, we're not salesmen. And I might add that both divisions of our subsidiary, the General Services Company, and GSC itself were sold about 2½ years ago."

Have the ventures into manufacturing been profitable? Howland says, "Oh, I guess by the time the terms of our sales contracts have expired we will come out ahead. But you must remember that we had to invest \$80,000 in these ventures before we got anything out." Has there been any criticism of your specifying packaged units incorporating principles that you developed for one of your projects? "No, I wouldn't say so," remarked Howland. "I really do not think there should be. Some consulting engineers will criticize the packaged unit concept, but I can hardly agree. The main thing in providing a professional service is to do a sophisticated and competent analysis of the client's problem. Based on this, if your judgment is that a packaged unit is the thing to specify, that is what you should do.

"I think the ultimate answer is in your performance, not only performance for the client but in the way you

perform your own operations. We continuously look for better ways to do things for the client and for ourselves. For example, come look at our facilities for automating our specifications. We started using the IBM MT/ST (magnetic tape/"Selectric" typewriter) in 1966. At that time we adopted the CSI format for specifications and started to put our master specifications on the MT/ST tapes. Now our people can fill out a form sheet indicating which standard sections should be picked up and what modifications for the particular job are required and we can turn out the finished product in a fraction of the time. We make this system available to other engineers for a fee."

With progressive and imaginative thinking on the part of all its principals — and all its people — CH₂M should continue to grow for a long time. And everyone involved will get enjoyment from their own contributions. As an example of the prevailing good humor, each weekly newsletter distributed to the employees contains a listing of that week's new contracts, giving the project number, client, type of service, and the project engineer's initials. Tucked in among the list in a recent newsletter were these items:

- C5951.0 1600 Pennsylvania Avenue, Washington, D. C.
Sewage study. AF
- C5001.6 Fort Knox, Louisville, Kentucky.
Gold leak investigation. AF

As suggested by the project engineer's initials, this was the newsletter for April 1. ▲▲

