

March 1942

TECHNOLOGY REVIEW

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ORDERS

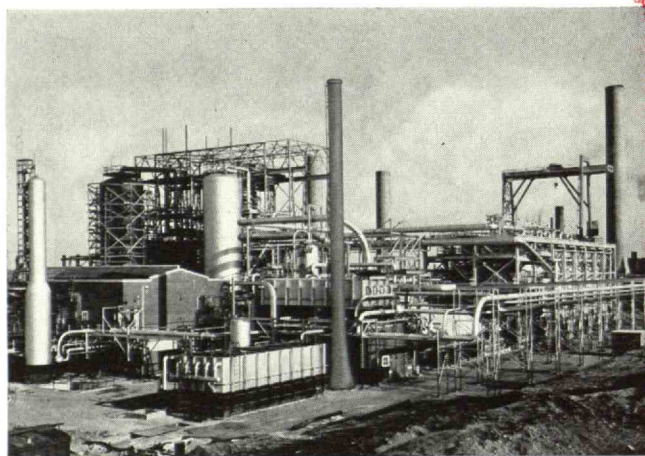
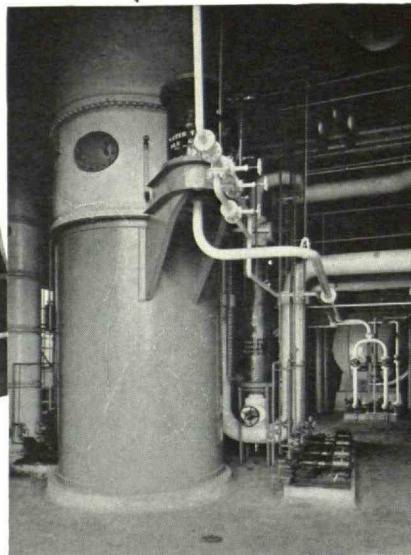
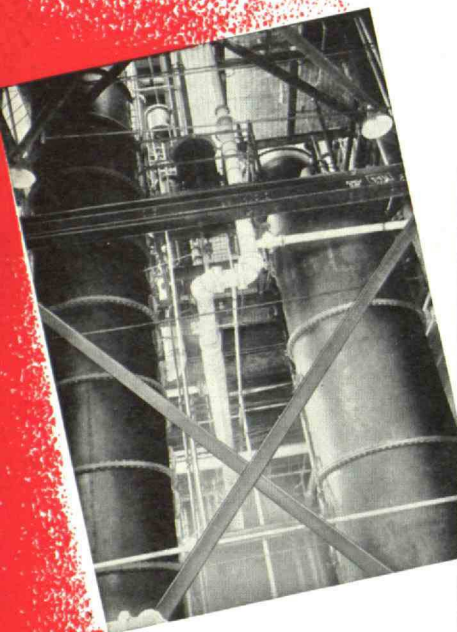
are not our only backlog

Yes, we're busy—very busy—as is the case with every other engineering and manufacturing firm we know. But “orders on hand” are far less significant than another backlog which has been building up over the many years we have been serving the process industries.

That other backlog is **EXPERIENCE** . . . one which is never depleted. Rather, it is ever on the increase.



Our chemical engineers and constructors are ready to help transform any embryonic project into a finished plant, quickly and economically.



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*Chemical Engineers and Constructors Specializing in
Distillation, Evaporation, Extraction and Solvent Recovery*

The Man Behind the Man Behind the Gun

NEEDS AO GOGGLES



As the world has come to realize, modern wars are won in factories. The men who turn out defense material are as important as the men who use it. It is a blow to National Defense when a worker is taken "off duty" because of an eye accident—tragically proven by the fact that *eye accidents alone* have kept hundreds of bombers from reaching the sky and battleships from strengthening the fleet.

Keep American workers on the job . . . keep their machines running . . . keep their production flowing—

with American Goggles. The American Line is the front line of defense for eyes and costs. It is *complete*—offering safe, cool, comfortable protection for every kind of work and from every type of eye accident. American deep-curved Super Armorplate Lenses, which can be ground to the individual prescription of all whose vision is defective, provide greater resistance to impact.

Ask your AO Industrial Representative to show you the complete line . . . and explain how easy it is to install a complete program of American Eye-Protection.

American Optical Company

Southbridge, Massachusetts

MANUFACTURERS, FOR MORE THAN 100 YEARS, OF PRODUCTS TO AID AND PROTECT VISION

THE TECHNOLOGY REVIEW, March, 1942. Vol. XLIV, No. 5. Published monthly from November to July inclusive at 10 Ferry Street, Concord, N. H. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription \$3.50; Canadian and Foreign subscription \$4.00. Entered as second-class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879.

Return of the Carbon Age

CARBON . . . one of Nature's oldest and most plentiful materials . . . is making possible some of industry's newest achievements.

In the *chemical* industry, massive black towers of carbon . . . erected in incredibly short periods of time . . . speed the delivery of vital acids. The all-carbon electrostatic precipitator . . . built of carbon from the bottom to the top of the stack . . . is now an actuality. Such towers can be erected in as little as a *week's time*! Staunchly immune to corrosion and thermal shock, they should last *indefinitely*.



Today . . . due to basic and applied research into the properties of carbon and graphite . . . it is possible to obtain these black, wonder-working materials in such a variety of forms—blocks, bricks, beams, tubes, pipes, and fittings . . . even valves and pumps . . . that almost any size or shape of structure can be built from them. For making tight joints, which give the structure uniform properties throughout, special carbon- and graphite-base cements have been developed.



Undisturbed by the torture of heat, carbon is also a "must" in the *metallurgical* industry. Carbon *cannot be melted* . . . will not soften . . . and has remarkable dimensional stability even at incandescent heat. In addition, it will not flake off and hot metal will not stick to it. That is why it is ideal for such uses as molds, cores, and plugs . . . for the lining of furnaces . . . and for sampling-dippers.



Because electric-furnace graphite conducts heat even *better than most metals*, it is becoming increasingly important in the manufacture of heat exchangers for the processing of corrosive liquids and gases.

These new uses for carbon and graphite . . . added to the almost interminable list of uses that existed before . . . make this era truly a carbon age. Your inquiries are cordially invited.

The strides made in the development of structural carbon, and in the uses of other carbon and graphite products, are greatly facilitated by the technical assistance of other Units of Union Carbide and Carbon Corporation including The Linde Air Products Company, Carbide and Carbon Chemicals Corporation, Electro Metallurgical Company, Haynes Stellite Company, and Union Carbide and Carbon Research Laboratories, Inc. — all of which collaborate with National Carbon Company in research into the properties and applications of carbon and graphite.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street  New York, N. Y.

This all-carbon electrostatic precipitator stands 55 feet, 2 inches high.

**STEAM Heats
America**

How the comfort and economy of modern steam heating can be extended to educational institutions through Webster Heating Modernization Programs is shown in the fact stories below. See how the Webster Moderator System saves fuel, increases the effective capacity of existing heating plants and improves heating service. A nation-wide organization of steam heating specialists helps to insure the effectiveness of Webster Systems of Steam Heating.

WARREN WEBSTER & COMPANY, Camden, New Jersey
Pioneers of the Vacuum System of Steam Heating : : Est. 1888
Representatives in 65 principal U. S. Cities

VILLANOVA COLLEGE SOLVES PROBLEM OF HEAT DISTRIBUTION

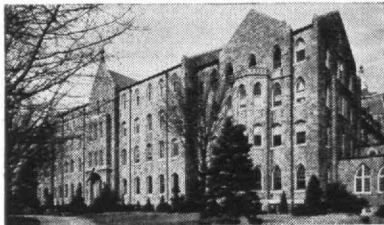
**Webster Moderator System Makes
Possible 25-30% Reduction in
Annual Steam Consumption**

CUTS COSTLY WINDOW OPENING

**Steam Delivery to Radiators is
Adjusted Automatically by
Outdoor Thermostats**

Villanova, Pa.—Villanova College, one of America's leading Catholic educational institutions, solved the heating problem in three College buildings by installing Webster Moderator Systems in 1940.

The buildings are Mendel Hall, including a dormitory, classrooms and administrative offices; Fedigan Hall and Alumni Hall, both dormitories.



Mendel Hall, Villanova College, Villanova, Pa.

"We are satisfied that we have found the ideal method of heat control for school or college buildings," says John Lawson, Controller. "We are getting exactly the temperatures we want at a saving of 25 to 30 per cent in steam consumption."

"We are particularly pleased with the control of steam delivery by the Webster Outdoor Thermostat feature of the Moderator System. This makes the heating of each of our buildings independent of window opening, saves steam."

The Superintendent of Buildings and Grounds is responsible for the well-planned operating schedule which assures maximum comfort from the Webster Systems.

Galligan Brothers, of Philadelphia, acted as modernization heating contractors.

The heating of two more Villanova College buildings was brought up-to-date in 1941 with Webster Moderator Systems.

UNIVERSITY SOLVES HEATING PROBLEM IN NEW BUILDING

**Northeastern "U" Meets Varied
Heating Needs by Installing
Webster Moderator System**

MINIMUM STEAM CONSUMPTION

**College of Engineering Located
in new Richards Hall Operates
on the Cooperative Plan**

Boston, Mass.—The beautiful new Richards Hall erected in 1938 on the campus of Northeastern University presented a problem in heat distribution that was solved by the installation of a Webster Moderator System of Steam Heating.

Richards Hall is used for a wide variety of purposes—administrative offices, lecture halls, classrooms, laboratories, recreation rooms, machine shops, lunch room and chapel. The Webster Moderator System provides the proper temperature in each room and in each section of the building with minimum steam consumption.



Richards Hall, Northeastern University,
Boston, Mass.

A Webster Outdoor Thermostat automatically adjusts the basic rate of steam delivery with every change in outdoor conditions.

Among other schools located in Richards Hall is Northeastern University's famed College of Engineering, the students of which alternate regular periods of classroom instruction with supervised employment in industry. Three hundred industrial concerns cooperate with the University in making this program effective.

V. J. Kenneally Co., of Boston, served as the heating contractor. There is a total of 32,354 square feet of installed direct radiation.

Richards Hall was designed by Coolidge, Shipley, Bulfinch and Abbott, well-known Boston architects. Charles T. Main, Inc., served as Consulting Engineers.

SOLVES PROBLEM OF DISTRIBUTING HEAT TO 1300 RADIATORS

**Webster Moderator System Used
In Famous Perkins Institution
& Mass. School for Blind**

WIDELY SEPARATED BUILDINGS

**Provides Comfort in Every Room
and thus Reduces Wasteful and
Unnecessary Window Opening**

Watertown, Mass.—The problem of distributing heat evenly and rapidly to approximately 1,300 radiators in the widely separated buildings of the Perkins Institution & Massachusetts School for the Blind was solved in 1937 as the result of a Webster Heating Modernization Program.

Before modernization, some sections of this well-known institution were hard to keep warm while other sections were frequently overheated.



Perkins Institution & Massachusetts School
for the Blind, Watertown, Mass.

The Webster Moderator System corrected the steam distribution weaknesses of the existing installation by means of Webster Metering Orifices in branch mains and radiator supply valves. All radiators now receive steam at the same time and exactly in proportion to need.

The four-zone central Control Cabinet of the Webster Type EH Moderator System enables the operator to meet the special heating needs of each section of the Perkins Institution & Massachusetts School for the Blind. Steam can be shut off in any section not in use, whether it is classrooms, offices or dormitories.

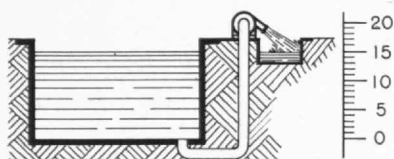
The elimination of overheating reduces wasteful window opening to the minimum.

The Cleghorn Company, of Boston, Mass., acted as modernization heating contractors.

H. F. MARSHALL '19

Just for Fun! A CHALLENGE TO YOUR INGENUITY

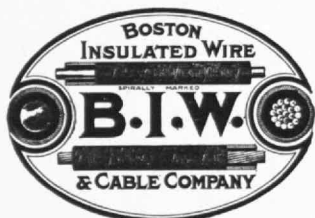
A CONSTANT speed centrifugal pump is to draw water out of a tank and discharge it into a ditch, as shown. (1) Will the drive motor be safe, if designed to handle the maximum (empty tank) lift of 20 feet? (2) Specify another design factor that should be checked.



Answers: (1) Power requirements of many centrifugal pumps increase with *decreased* lift: greatest rates of pumping may be expected when the tank is full. (2) Priming equipment should be provided, unless the pump can be lowered.

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West Orange, New Jersey



ELECTRIC CABLES for AIRCRAFT

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*Manufactured in accordance with latest Army and
Navy Specifications*

Special multiple conductor cable made to order — de-
signed for particular applications on instruments and
apparatus

**BOSTON INSULATED
WIRE AND CABLE COMPANY
BOSTON, MASSACHUSETTS**

THE TABULAR VIEW

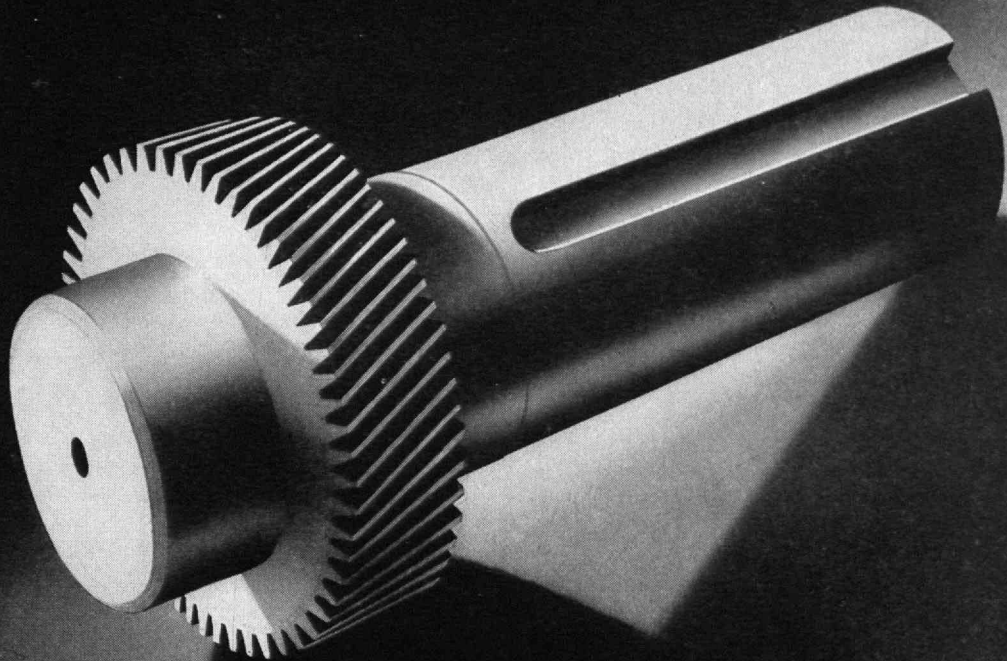
Matter and Mars. — In a world interconnected by technology, war necessarily means many maladjustments and dislocations even exceeding in their social and economic consequences the worst penalties which Ares exacted in earlier times. From the point of view of chemical industry, many evidences of this fact are to be discerned. AVERY A. MORTON, '24, Professor of Organic Chemistry and Director of the Research Laboratory of Organic Chemistry at the Institute, recently discussed several examples before the Alumni Council in a penetrating address from which his provocative article (page 216) is drawn. Another aspect of the relation between chemistry and our world is discussed by Professor Morton's colleague, AVERY A. ASHDOWN, '24, Associate Professor of Organic Chemistry, who reviews (page 215) a recent popular treatment of the subject.

Swift. — History is made at a fast pace in our times, in no small measure because of the acceleration of activities which the airplane has made possible. Naturally, then, the history of aviation itself, slender in point of years, should be extensive in point of content and complication. Few writers are more aware of this paradox than S. PAUL JOHNSTON, '21, frequent contributor to The Review on matters aeronautical. In this issue (page 218) Mr. Johnston tells the story of a pioneer in flight — a story interesting in its depiction of a sincere and courageous man and informative in its presentation of notes on the background of a major industry. Formerly co-ordinator of research for the National Advisory Committee for Aeronautics, Mr. Johnston is now with the Curtiss-Wright Corporation.

Food Framework. — Special demands not only on diet itself but also on the distribution of the materials of the dietary are imposed by wartime necessities. The planning and providing of proper food to meet emergency needs, and the establishment of a system of distribution and allocation calculated to give all parts of the population its requisites have been worked out effectively in Britain, as is pointed out (page 221) by ROBERT S. HARRIS, '28, Associate Professor of Biochemistry of Nutrition at Technology. Professor Harris' food researches for American antarctic expeditions are familiar to readers of The Review. At present his studies are concerned with wartime needs.

Deep Holes. — The drilling crews operating in American oil fields bid fair in many ways to become a focus of legend akin to that which clusters around the lumberjacks and rivermen of an earlier day. With what they do what they do is described in this issue (page 224) by GILBERT W. NOBLE, '25, Associate Professor of Petroleum Engineering at the Missouri School of Mines. Dr. Noble writes from firsthand knowledge and appreciation of his subject.

Chrome-moly steels speed production and lower costs



A manufacturer of speed reduction gear pinions is taking advantage of two of the outstanding advantages of Chromium-Molybdenum (4140) steel — uniform hardening in heavy section, and excellent machinability at intermediate hardnesses.

Pinion and shaft are machined integral from a 4140 round oil quenched and tempered to about 150,000 p.s.i. tensile and 300 B.H.N.

Uniformity in hardness of the heat treated bar assures adequate strength in the shaft even though its diameter is only about half that of the pinion. This integral construction eliminates an assembly operation and makes for better performance.

Our booklet, "Molybdenum in Steel," contains helpful data on Molybdenum steels. It will be sent without charge to interested students and graduates.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • CALCIUM MOLYBDATE

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*Shipbuilders and
Engineers*

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MAIL RETURNS

Automobile History

FROM FRANCIS A. ROULEAU, S. J., TO LEROY L. THWING, '03:

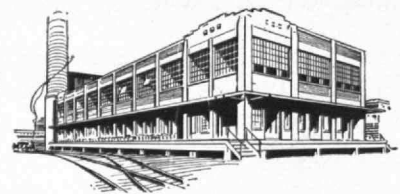
This is a letter that, by the most elementary requisite of gratitude, should have been written last May or June. It was in May, in fact, that I first received your article, "Automobile Ancestry," from The Review of February, 1939, along with your letter referring to source data on Verbiest, as well as a third enclosure containing translation of the chapter on pneumatics from Verbiest's original *Astronomia Europaea*. . . .

It was a great pleasure for me, as well as for the director of the Bureau Sinologique (a French Father), to receive this communication from you; and speaking for the both of us, we wish to extend to you our most genuine thanks for this thoughtfulness and for the trouble you have had to go through in forwarding this interesting matter to us. . . .

It goes without saying that all of us here were immensely interested in your fine, sympathetic description of Verbiest's experiment with the "steam wagon" — myself, perhaps, more than anyone (except the director, who is an enthusiastic specialist in the old Jesuit scientists at the Imperial Court). I have been for some time doing special work on Verbiest, and hence it is always a joy for me to come across anything written about him, particularly if it is written in English. So little has been done, apparently, in that language about the men who brought Western sciences to China in the Sixteenth and Seventeenth centuries. On this same subject the French, on the contrary, have a wealth of literature. . . .

About Verbiest's automobile experiment: Henri Bosmans, S. J., a Belgian specialist in Verbiest, treats of the matter in his scholarly *Ferdinand Verbiest, Directeur de l'Observatoire de Pékin*. You will like to know, I feel sure, that Bosmans puts the construction of this steam wagon a little later than you do in your article, that is, around 1678 instead of 1665. The argument for the year 1665 — I am simply following Bosmans — is based on the supposition that the *Astronomia* (printed in 1687) is a reprint of an earlier work published in 1668; and since Verbiest begins the chapter in question by stating that "three years ago" he constructed his machine, the year 1665 would be the date of the invention. It seems, however, that only one chapter of the *Astronomia* is a reprint (the fact is explicitly stated at the beginning of that chapter); the rest of the book, including our "automobile" description, is new matter. Bosmans arrives at his date in this manner: Father Couplet, one of the Peking scientists, left for Europe on business of the mission in 1681. He was something of a "press agent" for Verbiest; to him Verbiest (*Concluded on page 246*)

**Speed with
Economy**



U. S. Industrial Alcohol Company

Any company engaged in defense work has a job that calls for all-out effort.

If your commitments require an additional building, it will pay you to engage a builder experienced in defense construction.

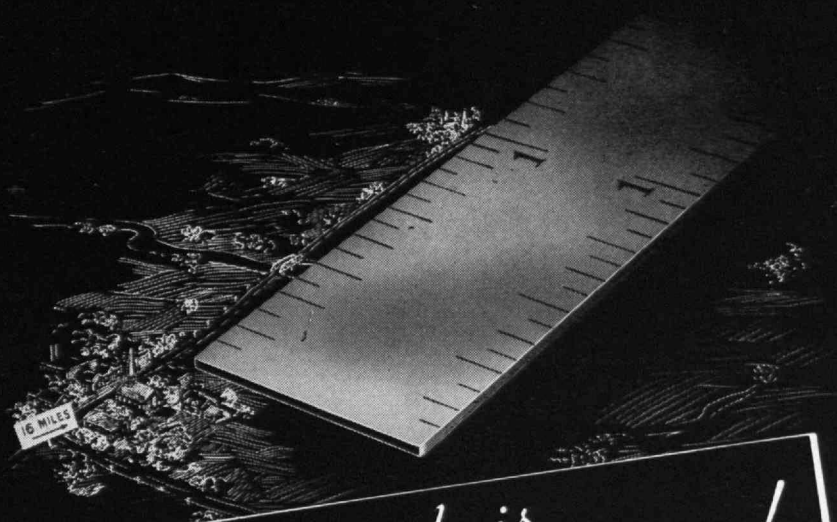
W. J. BARNEY CORPORATION

101 PARK AVENUE, NEW YORK

INDUSTRIAL CONSTRUCTION

Alfred T. Glassett, '20, Vice President

NORTON ABRASIVES



*When one inch is
Sixteen Miles Long!*

Today, quality and refinements in products of all kinds are uppermost in the minds of engineers. Practical instruments are measuring surfaces in terms of microinches.

Just what is a millionth of an inch? Magnify a millionth part of an inch up to one inch, and using the same rate of magnification an inch would be sixteen miles long.

The introduction of new alloys with new standards of precision to shoot at is keeping research engineers constantly on their toes. The near-perfect surfaces are produced with abrasives—processes of grinding, lapping, and superfinishing are results of exhaustive research. Through their endless research, Norton research scientists are bringing abrasive finishing processes nearer and nearer to absolute mechanical perfection.

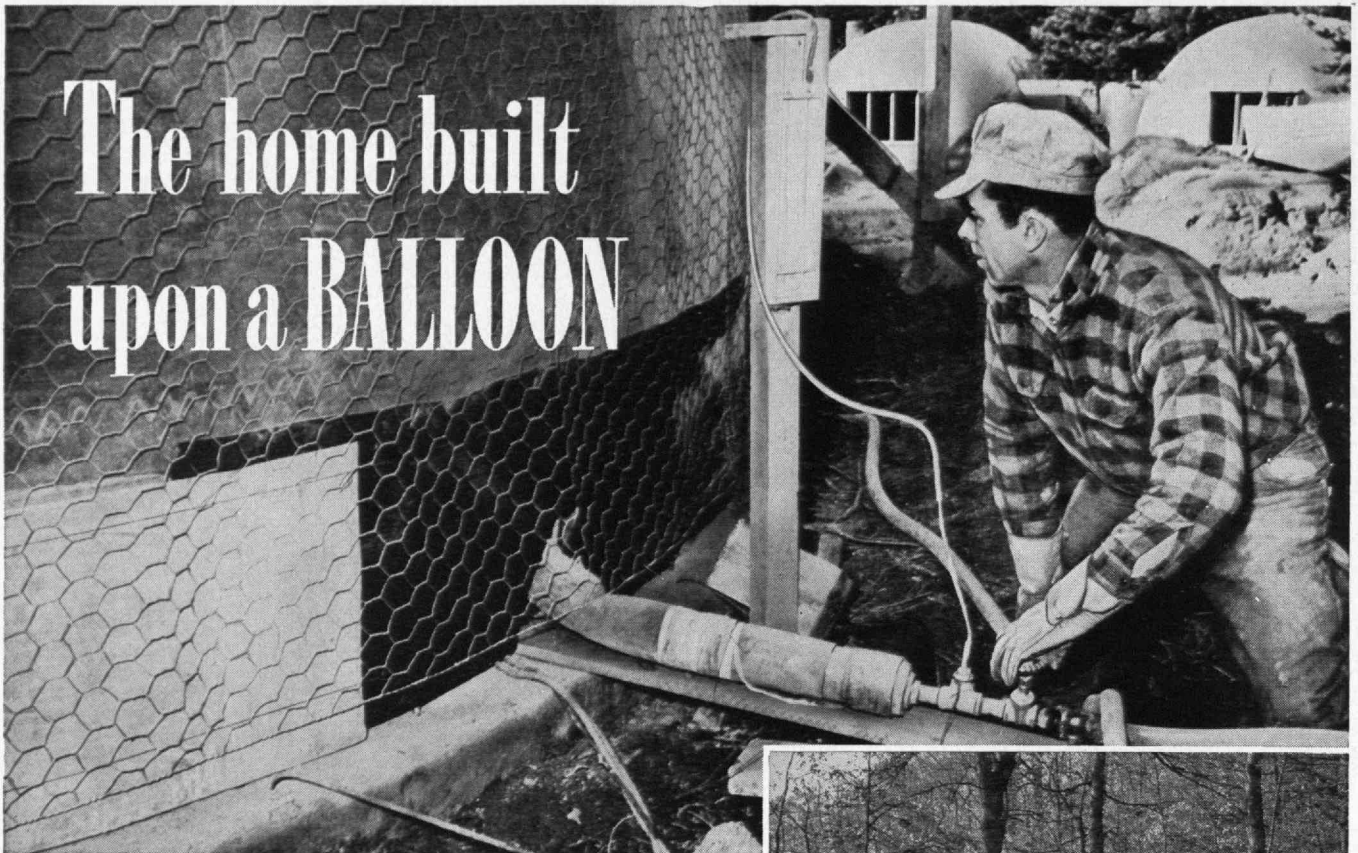
NORTON COMPANY, Worcester, Mass.

BEHR-MANNING DIVISION, TROY, N. Y.—Abrasive Paper and Cloth

WHEN IT'S AN ABRASIVE PROBLEM, CALL IN NORTON ENGINEERING



The home built upon a BALLOON



—a revolutionary use of Goodyear
rubber speeds defense housing

HERE you see an utterly new type of home construction, so rapid and inexpensive it promises a new era of expansion in American housing. It is a house literally built upon a balloon—an inflated rubber mold over which concrete is shot to form a fire-proof, termite-proof, earthquake-proof dwelling that ought to last for centuries.

A Los Angeles architect had the idea, but everyone said

it couldn't be done — until he met the G.T.M. — Goodyear Technical Man. After studying the job the G.T.M. produced a semi-spherical balloon built of heavy two-ply rubberized tire fabric. To build, the balloon is laced down to a concrete foundation, inflated, covered with wire mesh and coated with "GUNITE" — liquid concrete sprayed on with a hose.

In twenty-four hours the concrete has set. The balloon is deflated and removed in five minutes — concrete doesn't adhere to rubber. Insulation and another layer of "GUNITE" are applied to the shell, making a per-



Four-room home, built by "balloon" process, containing living room, two bedrooms, kitchen and bath

manent wall four inches thick. By repeating this process, a snug, warm and weather-tight home of four or more rooms can be quickly built.

So successful is this new construction, it is being considered for bomb shelters, powder magazines, cantonments, farm buildings and hangars as well as low-cost homes, as fast as Goodyear can design balloons of proper shape. Thus another new use of rubber can be credited to the ingenuity of Goodyear in working out a tough assignment. But handling concrete with rubber was no novelty to Goodyear, for long ago we developed a tough, abrasion-resisting hose for spraying concrete — the same type of hose used in building these "balloon" houses.

**Let the G.T.M. help you
speed production—with rubber**

The Goodyear Technical Man is an expert in all industrial applications of rubber. To consult him, write Goodyear, Akron, Ohio or Los Angeles, California — or phone the nearest Goodyear Mechanical Rubber Goods Distributor.

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