Defoaming

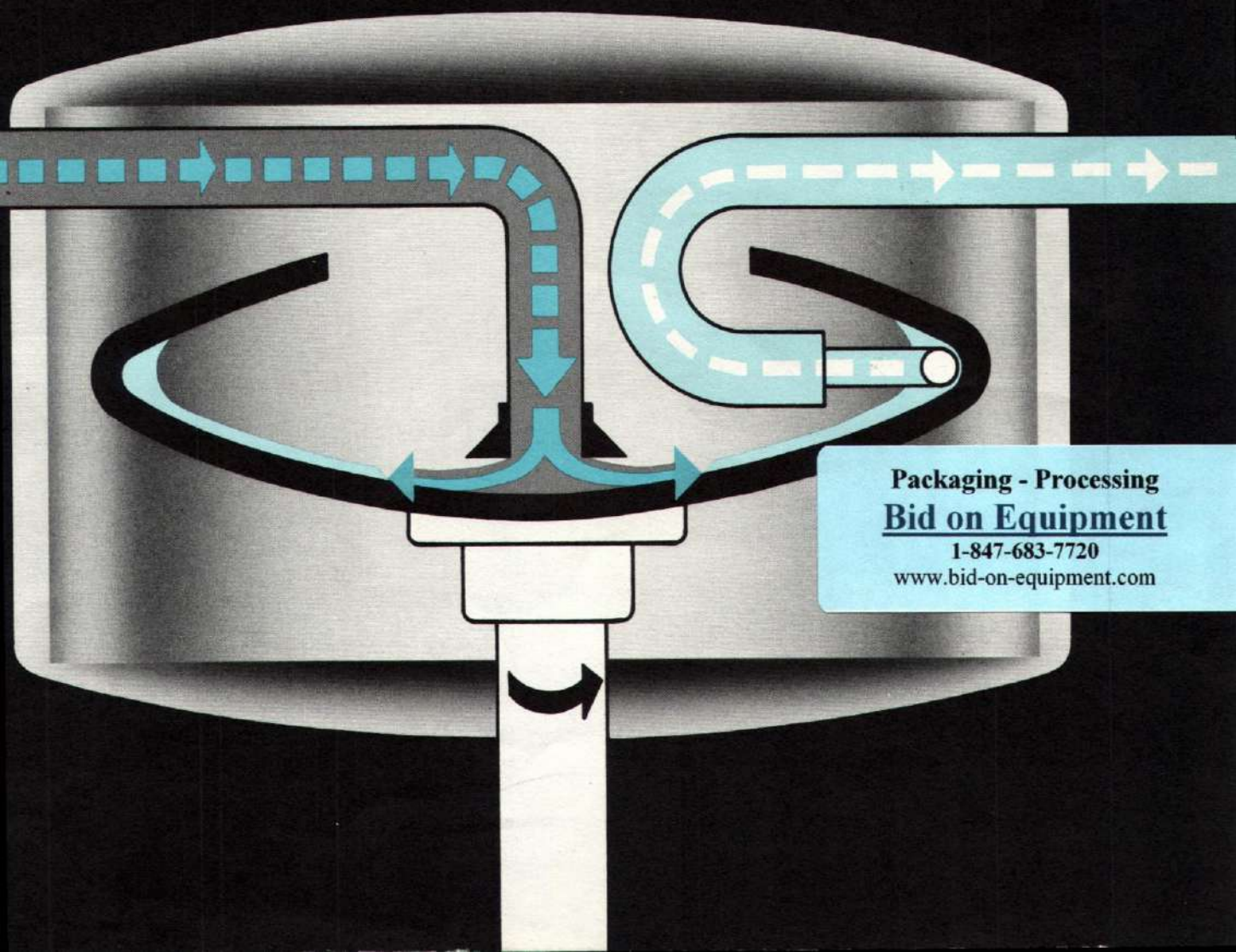
Operates in Three Modes

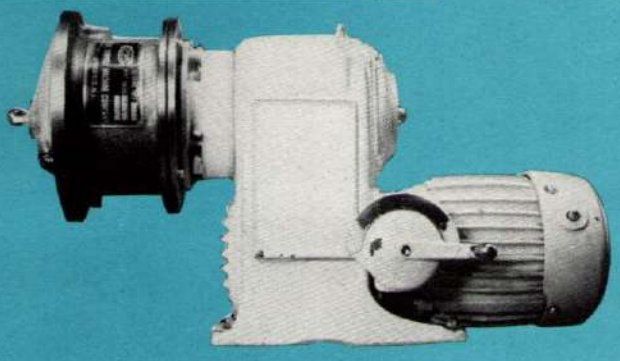
In vacuo
Under pressure or as
a chemical reactor

CORNELL'S VERSATILE Versator®

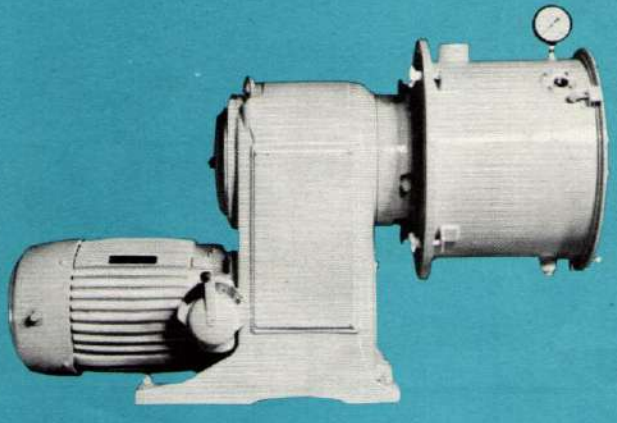
Ideal for a Variety of Flowable Materials

Adhesives	Food Products	Pastes
Antibiotics	Greases	Peanut Butter
Chewing Gum	Latices	Pharmaceuticals
Cosmetics	Lubricants	Plastisols
Detergents	Oils	Soaps
Emulsions	Organisols	Toothpaste

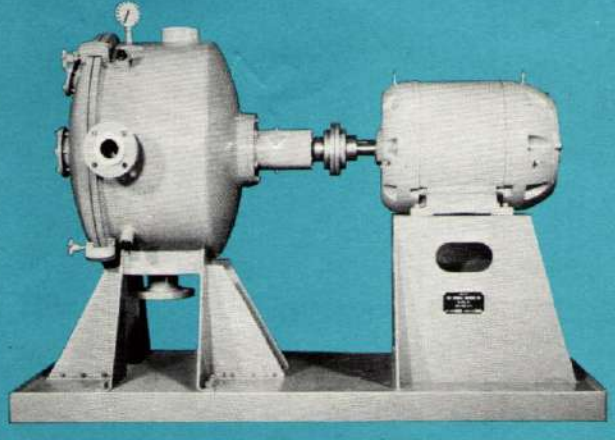




Disc: 8″ Diam.



Disc: 16″ Diam.



Disc: 26″ Diam.

Basic Versator Units

D-8 Disc: 8″ Diam.

2 hp variable speed drive

Speed range: 2000 to 6000 RPM

Ratings: Up to 2 U.S. gpm, depending on viscosity, adhesion factor and desired objectives.

Fabrication: Stainless steel fabrication. Base plates and/or auxiliary equipment supplied at moderate additional cost.

D-16 Disc: 16″ Diam.

7½ or 15 hp variable speed drive

Speed range: 1200 to 4000 RPM

Ratings: 1 to 20 U.S. gpm, depending on viscosity, adhesion factor and desired objectives.

Fabrication: Carbon or stainless steels. Base plates and/or auxiliary equipment supplied at moderate additional cost.

D-26 Disc: 26″ Diam.

Constant speed motors or suitable variable speed drives

Speed range: 1000 to 3200 RPM

Ratings: 5 to 125 or more U.S. gpm, depending on viscosity, adhesion factor and desired objectives.

Fabrication: Standard metals are carbon, stainless, and semi-stainless steel (disc, internal feed and discharge assemblies and connections are stainless steel; chamber and door are carbon steel).

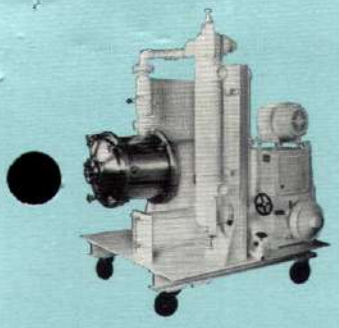
Standard base, of carbon steel, is approx. 4′ x 6′. Larger sizes can be ordered.

All Versator units are readily accessible for quick and easy cleaning. Parts subject to wear are few, simple, inexpensive and readily replaced.

Custom Versator Systems

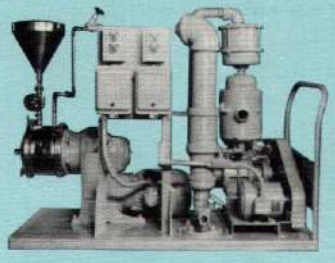
Cornell not only provides **basic** Versator units, but is equipped to custom design, fabricate and deliver complete **system packages**—ready to be hooked up and put into operation. Six typical systems of this type are shown at right. Each was specially made by Cornell to meet the needs of a particular application.

With this Cornell service you can obtain custom processing equipment without tying up your own engineering, production and maintenance operations. The Cornell Systems Department is staffed and equipped to handle just these sorts of projects —producing specialized processing units with maximum efficiency and at **minimum** cost.



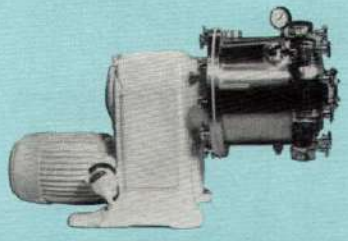
For Toothpaste Deaeration

In this custom system, a sanitary, polished stainless steel D-16 Versator has been joined together with a number of auxiliary units, including a condensor with receiver, vacuum pump and electrical switchgear—all mounted on a base plate with casters.



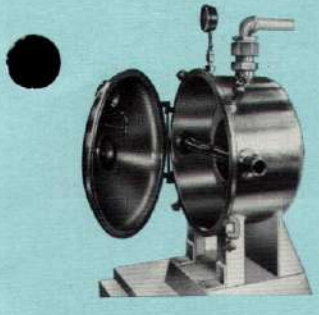
For Pharmaceutical Research

This Versator system includes a D-8 unit mounted on a buggy with auxiliary equipment. Built by Cornell for a pharmaceutical house, it is used to develop processing techniques for injectables, ointments and other products. It incorporates a knock-out drum system and dry-type vacuum pump with electrical switch gear.



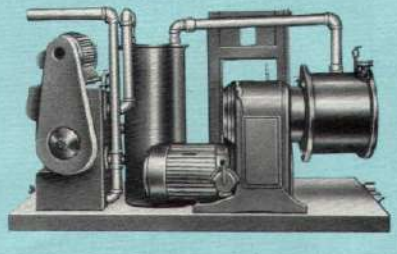
For Deaeration of Injectables

Comprised of a sanitary, polished stainless steel D-16 Versator and appropriate drive equipment, this custom system withstands low pressures so that it can be sterilized with 30 psi steam prior to processing injectables.



For Deaeration and Homogenization of Peanut Butter

In this system a D-26 sanitary, stainless steel Versator is mounted with a water-sealed vacuum pump plus a knock-out drum. In the processing scheme of which this system is a part, a stabilizer is injected into heated peanut butter which then runs through the Versator for deaeration and complete homogenization of the stabilizer.



For Dispersion and Deaeration of Plastisols

Mounted on skids for portability, this custom system includes a carbon steel D-16 Versator, knock-out drum, dry vacuum pump and electrical switch gear. Resins and plasticizers are pre-mixed in a kettle, after which they pass through the Versator for complete dispersion of the resin—and for simultaneous deaeration.

For Deaeration of Detergent Slurries

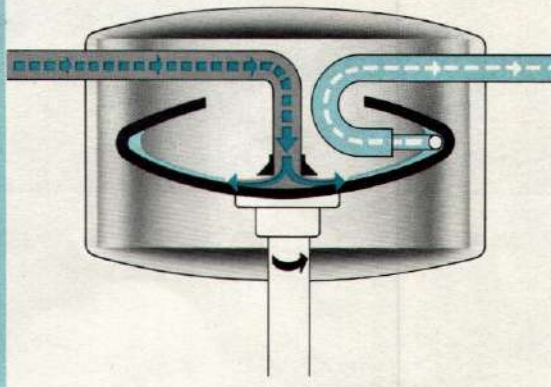
This Versator system makes use of a D-26 Versator to deaerate detergent slurries before they pass through spray towers where they are converted to dry powders packaged for dishwashing and laundry use. The system makes it possible to considerably reduce pressures at the spray nozzle, and to produce a more uniform product.

How They Work

for dispersion, homogenization, emulsification, deaeration or defoaming of an extreme variety of hot or cold flowable materials...continuously or in batch...over a wide viscosity range.

The Versator consists of a vacuum or pressure chamber with a disc in the form of an open bowl that revolves at speeds from 900 to 6000 RPM, depending on diameter and results desired.

The material being processed flows through a fixed or spring-loaded film-forming ring, out over the surface of the rotating Cornell disc. Centrifugal force drives it in a thinning, attenuated film over the disc with severe turbulence—which, combined with the shape, area and speed of the disc, develops tremendous shear forces. The result is a remarkably effective dispersing and homogenizing and deaerating action. Viscosity range is unusually broad: "from hot water to hot chewing gum!"



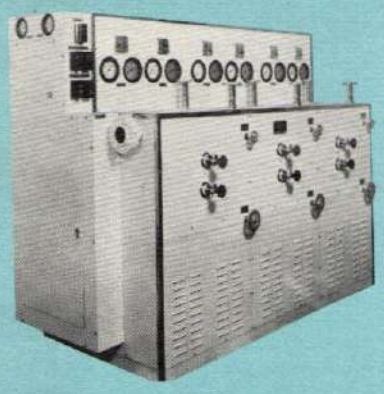
When the Versator chamber is under vacuum the expanding thin turbulent film releases entrained, diffused and dissolved air and gases while the dispersion or homogenization is being accomplished.

In warm or hot formulations under vacuum, residuals of water or solvents are flash-evaporated during the dispersion or homogenization.

When the chamber is under pressure the air or gases are entrained, diffused and absorbed while dispersion or homogenization is being accomplished.

As chemical reactors modified designs of the Versator offer unique possibilities for production and control of reactions favored by large area-to-mass ratios with high-speed dispersion.

CORNELL LUBE OIL BLENDING UNITS



AUTOMATIC PROPORTIONING PANEL

Continually, simultaneously and accurately measures each component of your blend and feeds them to Homogenizer.

Cornell Vernier Volume Controllers permit pumps to be set to an accuracy of better than 0.1%.

Automatic controls eliminate air and cut-off operation instantly if any constituent is not supplied at the required rate.

Simultaneously handles four base oils and four additives. Can be designed for any special combination.

HOMOGENIZING SECTION

Operates on same rotating Cornell Disc principle as the CORNELL VERSATOR.

Once-through, continuous operation for blending, dispersing, deaerating and dehydrating (where desired) to produce bright finished lubricating oil to your specifications.

Delivers finished oil, direct to storage tanks and/or on package-filling lines.

Allows controllable production rate to meet filling capacities.

Automatic controls synchronize operation with Proportioning Panel and your filling line rates.

Electrical Equipment to meet your code requirements.

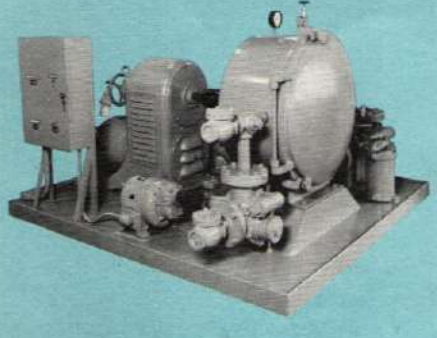
Capacities of 40, 60, 75, 90 or more G.P.M.

Flexible design to accommodate your exact requirements.

CORNELL GREASE HOMOGENIZERS

Continuous deaeration, dispersion, residual dehydration and finishing of all types of lubricating greases.

A compact "package" unit—approximately 6 by 6 feet floor area. Essentially foolproof in operation.



Incorporates Cornell principle of a rotating disc in an evacuated chamber. Adjustable from 900 to 2700 rpm.

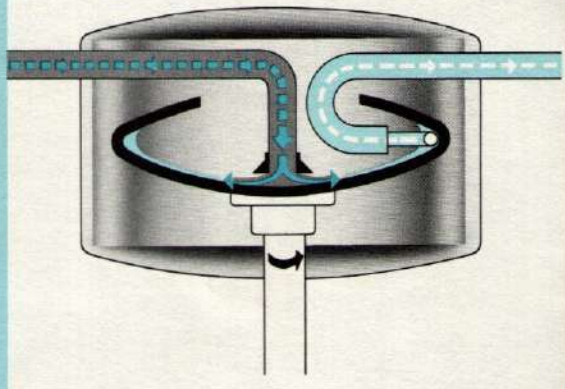
Feed rate adjustable from zero to full flow. Nominal capacity up to 400 pounds per minute—varying with consistency of grease.

Used to improve quality and appearance of virtually every type of lubricating grease manufactured today—batchwise or continuously.

Standard model furnished with drip-proof motors and standard switchgear and wiring. Can be supplied with explosion-proof, class 1, group D electrical equipment and wiring or other code requirements and to operate on whatever electrical power you have.

CORNELL'S VERSATILE Versator®

CONTINUOUSLY OR IN BATCH, IT ECONOMICALLY...



MIXES AND BLENDS—The Versator will mix and blend two, three or multiple components. Maximum economy results from instantaneous and perfect dispersion at high rates of throughput.

DEHYDRATES—You can obtain partial or complete dehydration, including flash evaporation under vacuum to protect heat-sensitive materials.

DISTILLS (RESIDUALS)—Where conventional equipment is inadequate, the Versator provides economical and effective distillation.

DEFOAMS, DEAERATES, DEGASSES—It will defoam, deaerate and degas liquids—continuously or in batch—at low cost.

DISPERSES—The Versator is perfect for products like coatings, pastes and light finishes. It disperses one or more finely divided solids in one or more liquids and, if desired, simultaneously deaerates.

IRRADIATES—Because it develops a highly turbulent and attenuating film, the Versator could permit better utilization of ultra violet rays.

YOUR REPRESENTATIVE IS

THE CORNELL MACHINE COMPANY
45 Brown Avenue, Springfield, N. J. 07081
Telephone 201-379-6860

PRINTED IN U.S.A.

THE VERSATOR

A PRODUCTION TOOL USING THE CORNELL PROCESS FOR:

New Processing Techniques
New Products
Product Improvement
Increased Production
Batch or Continuous Operation

APPLICABLE TO:

Any flowable materials (most fluid to most viscous) in vacuo or under pressure, hot or cold.

WHICH REQUIRE: UNIT OR MULTIPLE OPERATIONS SUCH AS:

Dispersion
Deaeration
Dehydration
Distillation of Residuals
Degassification and conversely, gassification
Homogenization
Emulsification
Irradiation
Chemical Reactions

DESCRIPTION AND PRINCIPLES OF OPERATION:

The VERSATOR is basically simple in both construction and principles of operation. While there are minor modifications in design and construction the basic machines are the horizontal shaft units, figure 1 or the vertical shaft units following figure 1 as drawing DO-100-2.

Referring to the drawing DO-100-02, the machine is seen to consist of a vacuum or pressure chamber mounted on a base. In the chamber is a 26" diameter disc in the form of an open bowl.

Disc speed may be as low as 900 rpm but for most processing is between 1400 and 2000 rpm.

The material being processed enters the unit through the $2\frac{1}{2}$" feed connection and is impounded at the center of the rapidly spinning disc by either a fixed or a spring-loaded film-forming ring which can be pre-set to determine the initial thickness of the entering film, if pressure and rate of flow are held constant. In general the film formed around the center of the disc is held to an initial thickness of a small fraction of an inch.

Thus when a given increment of the mass to be processed is initially fed onto the spinning disc, the following effects occur:

1. Centrifugal force drives the mass away from the center of the disc. The surface of the entering mass is rapidly increased, becoming an expanding film with correspondingly decreased thickness, and the entire mass approaches the characteristics of a two-dimensional surface.

2. The wetting or adherence of the mass to the surface of the disc, the curved path, gravity, viscosity, cohesion, surface tension, and centrifugal force subject the mass and all its components to forces of successively varying intensity.

3. Turbulent flow results which combined with the shape, area, and speed of the disc develops:

   (a) Tremendous shear forces as the foregoing actions take place in a fraction of a second.

   (b) Remarkably effective dispersing and homogenizing action.

   (c) Extremely rapid and multiple positioning of the particles of the mass on the top surface of the film.

As these effects can be coupled with operations in vacuo, under pressure, with pre-heated or pre-cooled material fed into the machine, a wide range of production possibilities becomes available. Unit or multiple processes for a particular product may be developed such as:

MIXING AND BLENDING

The mixing and blending of lubricating oils and additives, even up to six components, is standard practice using Cornell processing equipment in the Petroleum Industry. In addition to the remarkable quantitative control of components using Cornell proportioning equipment, extremely accurate operating control is obtained wherein additives amounting to only 15/100 of 1% are used. Thus, in addition to economical large scale production with extremely high quality control, an appreciable saving in the additives required is obtained due to the perfect dispersion.

DEHYDRATION

The VERSATOR is valuable in the dehydration of heat sensitive materials under vacuum. Such materials can be partially dehydrated or reduced to the anhydrous state as desired. Normally the "wet" feed is heated before being fed to the VERSATOR and its sensible heat utilized for providing the latent heat of evaporation. Time of exposure more often than the degree of temperature determines whether or not heat sensitive materials are damaged by heat. Hence, by passing the material through a pre-heater, then feeding directly into the VERSATOR where flash evaporation promptly cools it, it may become possible to heat quite delicate materials considerably above what is normally regarded as a damaging temperature, without harm. Where this is not possible, the material should be pre-heated to some lower temperature which means, that re-cycling becomes necessary.

DISTILLATION

For materials which can not be properly or economically distilled or stripped of residuals in conventional equipment the VERSATOR offers a practicable and efficient possibility for solving such problems. Heating of the feed may be accomplished by utilizing a pre-heater in the manner described in the preceding paragraph. The turbulent films provide high

transfer coefficients and permit distillation of sensitive materials since the distilland is in contact with the disc for only a fraction of a second. Moreover, since distillation takes place from the "all-surface" film under vacuum, this evolution of volatiles keeps the distilland relatively cool so that it leaves the VERSATOR with only a slight increase in temperature over the theoretical drop.

DE-GASSIFICATION AND GASSIFICATION

When the chamber is operated under vacuum, any material passed through the VERSATOR is promptly deaerated or de-gassed since the vacuum and internal pressures in the turbulent mass combine to effect removal of gaseous constituents. De-gassing liquids in bulk is so inefficient and time-consuming that in many cases no attempt is made to de-gas. With the VERSATOR, it now becomes possible to secure highly profitable results by de-gassing many products to secure better keeping qualities, lowered viscosities, better color and, in general, over-all improvement in physical characteristics.

Food products, pharmaceuticals, cosmetic creams, toothpaste, etc., respond favorably to deaeration. This operation is economical and may be a very profitable one; enhancing value and customer acceptance by improved appearance and keeping qualities.

Another closely allied operation can be performed in the VERSATOR: If the material being processed is moderately viscous or has high surface tension, for instance, oils, shaving cream, mayonnaise, or latex, it can be "fluffed-up" with air, carbon dioxide or other gases. Here the chamber is likewise operated under a positive gas pressure, thus providing for maximum gas absorption. By regulating gas pressure, through-put rates, and the speed of the disc, bubble size and final volume of the aerated material are controllable.

HOMOGENIZATION AND EMULSIFICATION (DISPERSION)

The VERSATOR is a superior tool for dispersing liquids in liquids, certain solids in liquids, gases in liquids, and flowable pastes. The limit of effectiveness is governed generally by the flowability of the components (liquids and semi-liquids) and in the case of gas absorption those mechanical and equilibria factors which normally govern such processes noting that absorption is increased as surface velocity is increased.

As typical examples of emulsification, water and crude oil make a "tight" emulsion without a stabilizer and in blending lubricating oils the chamber must be under vacuum else air will be entrained and dispersed to produce a non-edible "mayonnaise".

Paints, pastes, coating and similar products consisting of one or more finely divided solids dispersed in one or more liquids may be effectively and economically processed where the crux of the problem is to remove entrained or absorbed air and moisture from the solid particles, so the liquid can properly wet them. The VERSATOR is not offered as an economical mill for breaking down particle sizes or hard aggregates unless such particles or aggregates are readily friable.

IRRADIATION

Irradiation of fluids by ultra-violet is generally handicapped by the ray's lack of penetrative power. The turbulent micro-film presented by the VERSATOR may eliminate this difficulty and deserves consideration.

REACTIONS AND DIFFUSIONAL PROCESSES

When it is desirable to combine gases such as oxygen, hydrogen, chlorine, carbon dioxide, etc. with a liquid, the material to be gassed is fed through the VERSATOR and the gas is introduced into and held in the chamber under pressure. As the material moves over the disc, each particle in the highly turbulent "all-surface" film is intimately exposed to the gas, consequently, high speed gas absorption is obtainable. Temperature control vital to reaction efficiency may be simplified as the material fed to the machine is in and out in a fraction of a second.

PATENTS

The VERSATOR and its use are covered by patents, the enjoyment of which are included by agreement in the purchase or lease.

TYPICAL RESULTS - "MULTIPLE OPERATIONS"

Dispersion with simultaneous dehydration and deaeration:

Resin in hot gum, removal of 2% residual moisture

Hot greases (soaps in lubricating oils)

Dispersion with simultaneous deaeration:

Resin-oil-plasticizer formulations (elastomers)

Certain resins in certain plasticizers (plasticols)

Ointment formulation

Emulsification with simultaneous deaeration:

Latex and components

"UNIT OPERATIONS"

DEAERATION:

Printing Ink
Toothpaste
Peanut Butter
Reclaimed rubber dispersion
Detergent formulations

Deaeration or dehydration are effected by applying vacuum to the chamber. Where these results are not desired the VERSATOR is run with the chamber at or just slightly below atmospheric pressure.

Rates of flow range from 5 to 90 gallons per minute depending upon the viscosity of the material as processed and the density. Equal results for particular product are usually over a wide rate of feed at a set speed. This permits the grease maker, for example, to process from 50 to 200 pounds per minute or blend oils from 10 to 90 gallons per minute with constant quality.

ECONOMIES

Power requirements are relatively low - approximating 7-1/2 H.P. to 20 H.P. at 1800 r.p.m. respectively for a production range of 7-1/2 to 75 gallons per minute. Auxiliaries such as feed and vacuum pumps may require 3 to 7-1/2 H.P. in addition.

MATERIALS OF CONSTRUCTION - STANDARD

1. Carbon steel.
2. Semi-stainless - the disc-hub-shaft, internal feed and internal discharge assemblies are stainless.
3. Stainless - the entire chamber with disc-hub-shaft, internal feed and internal discharge assemblies are stainless.

Other metals will be considered and if suitable a proposal will be prepared.

CLEANING

A study of the design shows how easy it is to clean. Special hand holes and drainage connections are readily installed during fabrication and construction.

MAINTENANCE

Parts subject to wear are few, simple, readily replaced and inexpensive.

THE VERSATOR IN YOUR PLANT

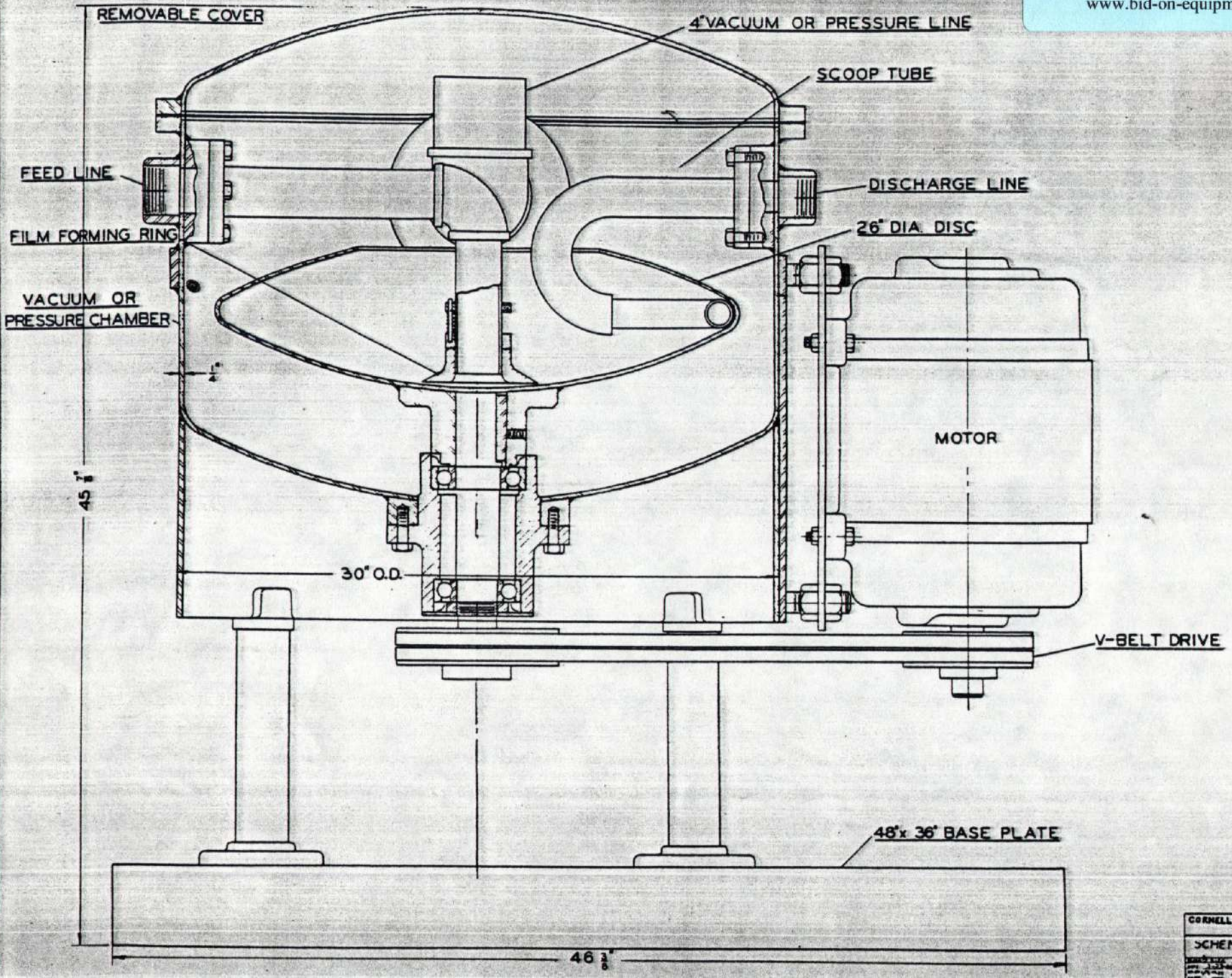
This memorandum is intended to indicate the possible flexibility and economy which may be applicable to your processes and products.

It is recognized that test runs to develop optimum production and control for quality products require time and technical study. For such problems the Cornell Machine Company is prepared to lease one or more units embodying such mechanical modifications of materials, design, and construction deemed best suited to these problems. The marked advantages of this procedure are:

1. That the tests may be made on surprisingly small batches to determine rate of processing for acceptable quality standards and establish proper operating procedures.
2. As the same unit may be thrown promptly into full scale production, the loss of time (overhead cost) and delay in serving a competitive market by pilot plant design and operation is avoided.

You may without cost or obligation on your part send a description of your problems along with proper data for analysis and recommendations.

THE CORNELL MACHINE COMPANY
99 Wall Street, New York 5, N. Y.
WHitehall 4-6125



CORNELL MACHINE CO.
SCHEMATIC ASST
DD-100-2