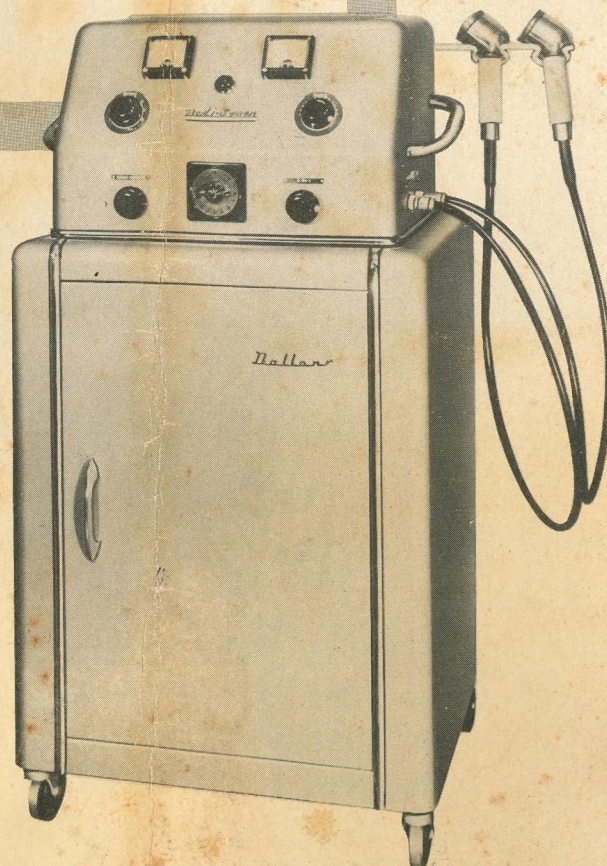


The reputation of Dallons Laboratories as a foremost contributor to the field of Physical Medicine for over a quarter of a century, is your assurance of the finest equipment, backed by extensive research and experience.

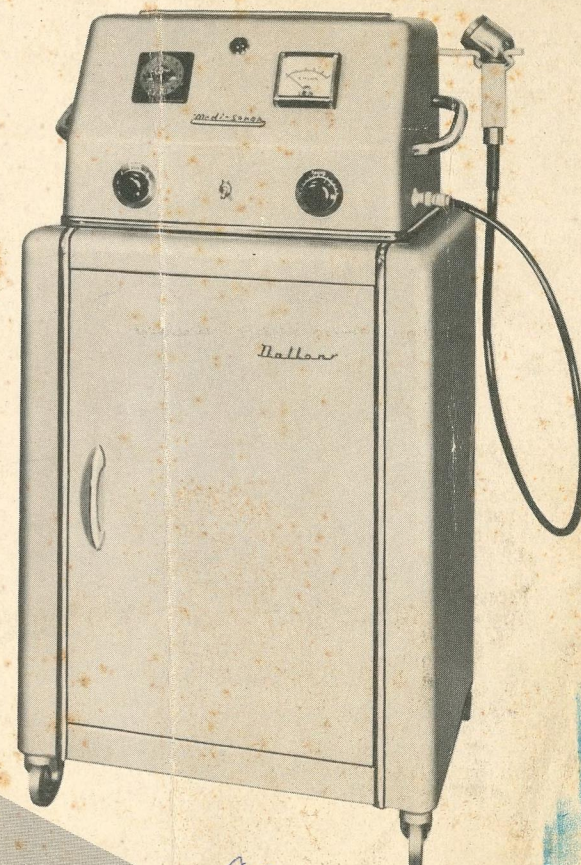
MEDI-SONAR
MODEL
3050



DALLONS LABORATORIES INC.

5066 Santa Monica Boulevard • Los Angeles 29, California

MEDI-SONAR
MODEL
1050



**QUESTIONS
and ANSWERS
ABOUT**

ULTRASONICS

DALLONS LABORATORIES INC.

5066 SANTA MONICA BOULEVARD
LOS ANGELES 29, CALIFORNIA



Brazilian quartz crystals are unpacked and carefully graded by crystallographer who examines each crystal for organic defects. Crystals are cemented to mounting blocks with optic axis approximately parallel to base of block prior to x-ray analysis.



The crystal is now placed in high precision diamond saws with reference edges identical to those in the x-ray diffraction equipment. A test cut or wafer is made and sent back to the x-ray diffraction equipment for double check. If the angle of cut needs no correction, the operator continues cutting the crystal in wafers of appropriate thickness allowing for subsequent grinding and polishing operations.



Crystal wafers are cut into round crystal blanks which are then ground in a planetary lap which obtains high degree of parallelism between major faces of the blank and in a high degree of flatness. The radio receivers near the machines pick up the natural frequency of the quartz as they are ground in planetary lap. This signal is created by the piezo-electric effect when the pressure of the lap plate on the crystal is exerted.



QUESTIONS AND ANSWERS

1. What is ultrasound?

The term "Ultrasonics" or "Supersonics" is derived from the acoustic field which deals with sound frequencies above the limits of the human ear. By the emission of sound waves of high frequency and short wave length many phenomena have been discovered not previously found in the audible acoustic range.

2. Which ultrasonic frequencies are used in medicine?

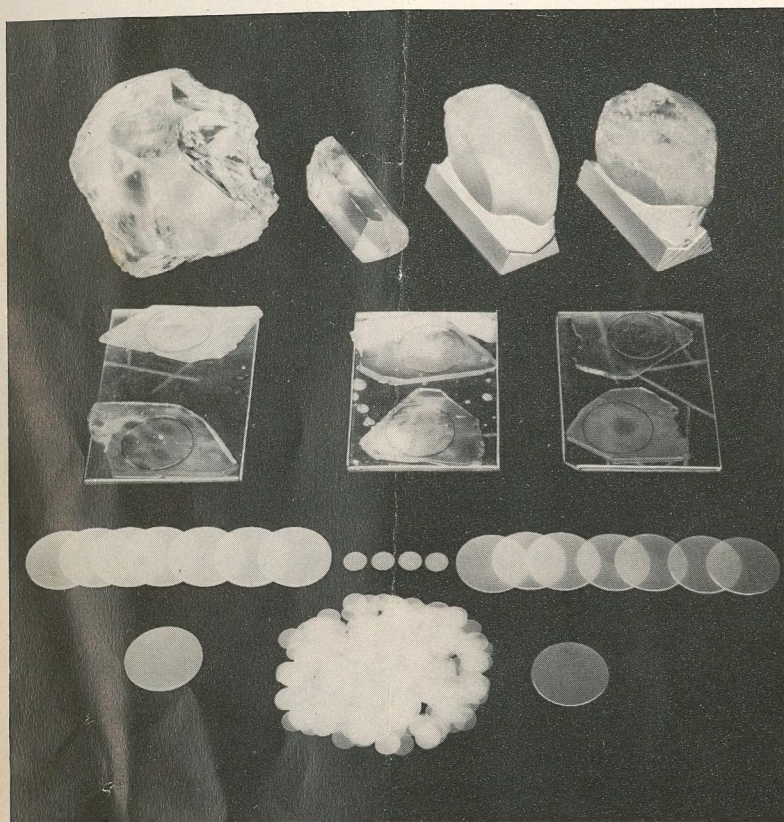
The frequencies of choice for ultrasonic therapy are from 800 kilocycles to 3000 kilocycles.

3. How is ultrasound produced?

Ultrasound is produced by several methods, but the method of choice for ultrasonic therapy is the utilization of the well known piezo-electric properties of quartz crystals. There are many crystalline piezo-electric materials, but among the elastic substances, quartz has, to the greatest degree known, this property of enabling high Q to be attained. Q is a number used in acoustics and in electrical engineering, for vibrating systems to gauge the relative efficiencies of transfer of energy back and forth between strain and motion, or from potential to kinetic energy. In other words, a bell made of quartz and contained in an evacuated chamber so that it radiates no sound, would ring longer once struck than if made of any other material. Such a quartz bell, once started at its resonant vibrations and without being further driven, would complete several million vibrations during the time of the decay of its vibrations.

It is the degree of long-ringing power which gives natural quartz excellent piezo-electric properties, high physical stability, and durability. Under the influence of an electric

field quartz in its crystalline form is subject to significant mechanical deformations. This mechanical strain at any point in the quartz may be a flexure or an extensional mode of motion depending on the direction of the applied electric field in relation to the crystallographic axis. Therefore, when a piezo-electric quartz plate is put in an alternating electric field in the same direction as the piezo-electric axis, mechanical vibrations will result with the same period as that of the



Group of crystals showing progression from raw material to the wafer and finished crystal blank. All sizes and thicknesses are made depending on final application.



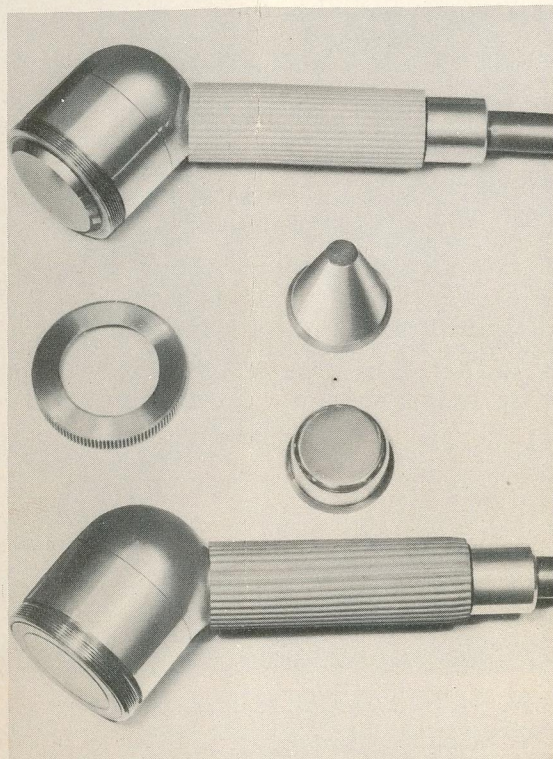
Assembly of power supply for ultrasonic units.

electric field. Maximum amplitude of the vibrations will take place at resonance or when the period of the electric field is the same as the mechanical period of the quartz crystal. The thickness dimensions of the quartz crystal controls its natural frequency.

4. What are the physical properties of ultrasound?

As explained before, when the crystal changes in dimension as it is subjected to an alternate electronic field, it is this motion which produces ultrasonic waves. Ultrasound is a purely mechanical energy. It is virtually the same as that received by the human ear in the audible range of frequencies. They are the vibrations which produce mechanical compressions and rarifications, which are much the same as those of the vibrating strings of a violin or piano. While ultrasonic waves obey the same laws of acoustics as do the audible sound waves, ultrasonic waves are of much higher frequency. Because of the tremendous number of vibrations

per second, the energy of each compression and rarification is of a very high magnitude and because of the high frequency of the ultrasound, the vibrations are so close together that they produce a disturbance of cell size in tissue. This cell size disturbance is sometimes referred to as cell massage or micro-massage. The propagation of ultrasound always requires matter as a conducting medium. They cannot be propagated in vacuum and only very poorly in air. Ultrasonic energy can be concentrated in a beam which can be directed at any particular target, providing it is coupled and conducted through matter.



Finished transducers and applicators.

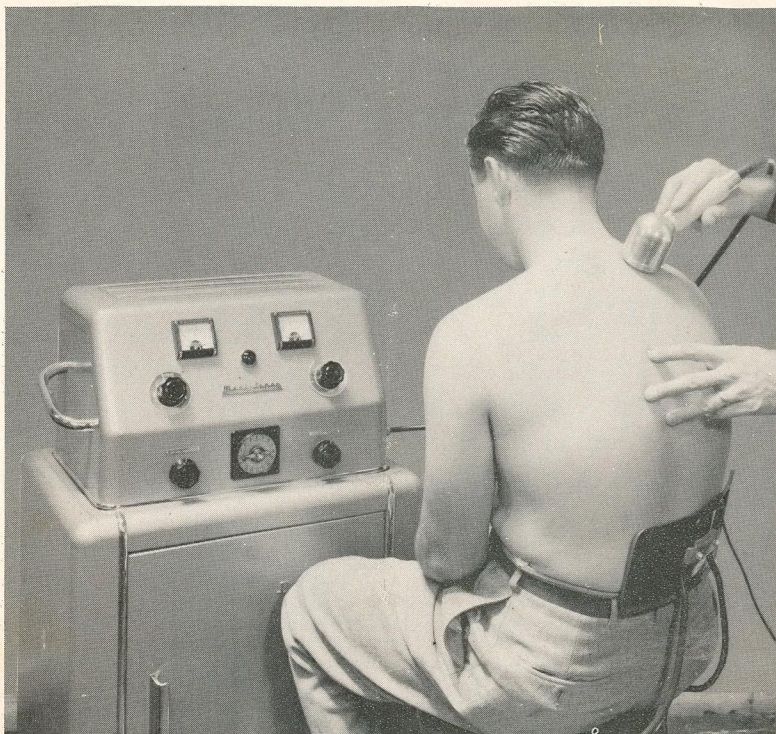
5. What are the main component parts of an ultrasonic generator?

There are two main components in an ultrasonic generator. The electronic section which consists of a power supply and an oscillator which supplies the necessary power to set the piezo-electric crystal in motion. The oscillator is tuned at the natural frequency of the quartz crystal. In the case of the Medi-Sonar, the oscillator is tuned at a frequency of 1000 Kc in model #1000 and in model #3000 two separate oscillator sections are used at frequencies of 1000 and 3000 Kc to drive two quartz crystal transducers operating at 1000 and 3000 Kc respectively. The power supplied to the crystal is adjustable in 8 steps to deliver accurate intensities of ultrasound from a few hundredths of a watt per square centimeter of the transducer head to as high as 4 watts per square centimeter of the transducer head. The second major component of the ultrasonic generator is the transducer head itself. It consists of a precision quartz crystal having an area of 12.5 square centimeters mounted in a suitable water-proof enclosure often referred to as the sound head. The sound head is connected to the oscillator by means of a coaxial cable. The effective area of the sound head which contacts the patient is 12.56 square centimeters. The Medi-Sonar crystal is therefore of approximately the same size as the effective area of the sound head. This is an important advantage of the Medi-Sonar unit as compared to other makes which use crystals much smaller than the size of their sound heads.

6. How is ultrasound applied and what are the methods of treatment?

A. Direct Contact Technique:

Coupling — To transduce ultrasonic energy effectively, it is necessary to use a coupling agent between the sound head and the part to be treated. Mineral oil or glycerin and other air-free liquids are satisfactory agents using



a generous amount to avoid dry spots. The slightest layer of air between skin and the sound head will stop the transmission of ultrasound.

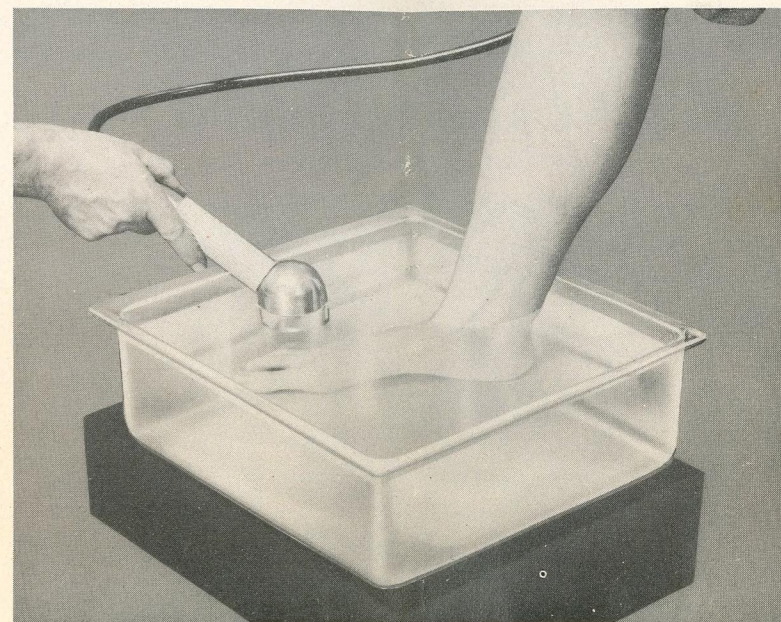
B. Rotating Motion Technique:

The sound head is placed firmly against the skin, but with just enough pressure to enable the movement of the sound head in a slow rotating motion. The perimeter of the rotation need not be more than from half to three quarters of the diameter of the sound head while going over the area to be treated. The area to be treated must be well defined by prescription of the physician in charge. It has been found that movement of the sound head will produce a more uniform distribution

of energy over the target area and will avoid spot heating. For optimal results, proper application and dosage are of paramount importance.

C. Sound Head Attachments:

When it is desired to treat small targets which may be difficult of access, the area of the sound head may be reduced and brought forward of the main body of the instrument by selecting an attachment of the right size. Oil must be used as a coupling medium between transducer head and base of the attachment.



D. Stationary Treatment:

Unless a strictly localized target is to be sounded, stationary treatment is not generally recommended unless extremely small intensities are applied.

E. Underwater Treatment:

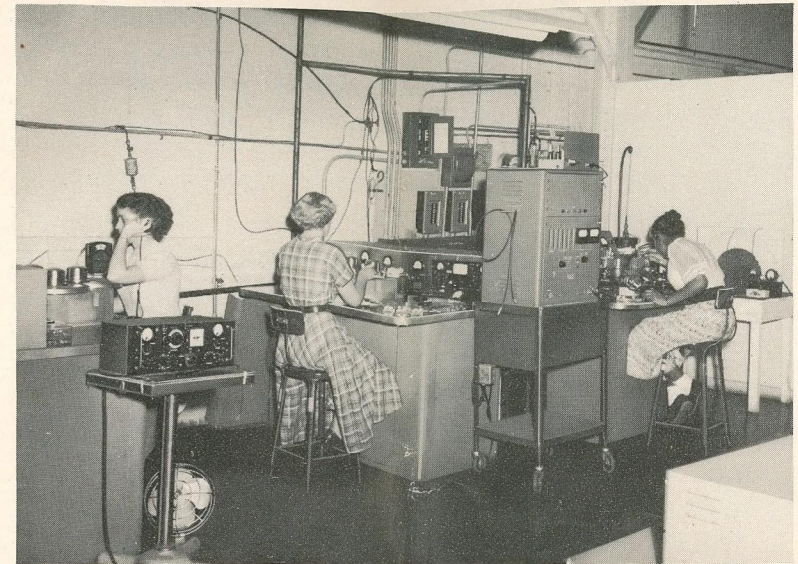
Underwater sounding is recommended where contact with the skin is not practical because the parts are too uneven, as in the case of small joints in feet and hands or in cases where the parts are very sensitive to pressure. The sound head should be submerged and moved slowly over the area treated at a distance of from one-half to one inch. The water should be boiled before use to eliminate most of the occluded air.

F. Dosage:

Acoustic energy is measured in watts per square centimeter or in total output in watts of the effective area of the sound head. Each Medi-Sonar has a calibration chart which shows the output of ultrasound in watts for the total effective area of the sound head as well as the average output per square centimeter. The secondary



Maintenance shop showing Blanchard grinders, etc. for maintenance of lap plates to high degree of flatness.



Frequency measurement and finishing stations of crystal blanks to precise frequency. At this position the blanks are checked for crystal activity, which is the impedance measurement of the crystal. Uniform crystal activity will insure uniform ultrasonic output under similar electrical conditions.

factor in dosage is the duration of the treatment, but it is much less important than the intensity prescribed. In most cases, it has been found that a duration of 5 to 10 minutes of treatment per area is adequate. However, the intensity prescribed by the physician must be accurately selected according to the condition, since it has been determined that an optimal intensity must be reached before desired results are secured from ultrasonic treatment. Dosage must therefore be individualized. While it is advisable to avoid a too high intensity which will provoke pain, experience and good judgment as well as a thorough knowledge of anatomy and under-

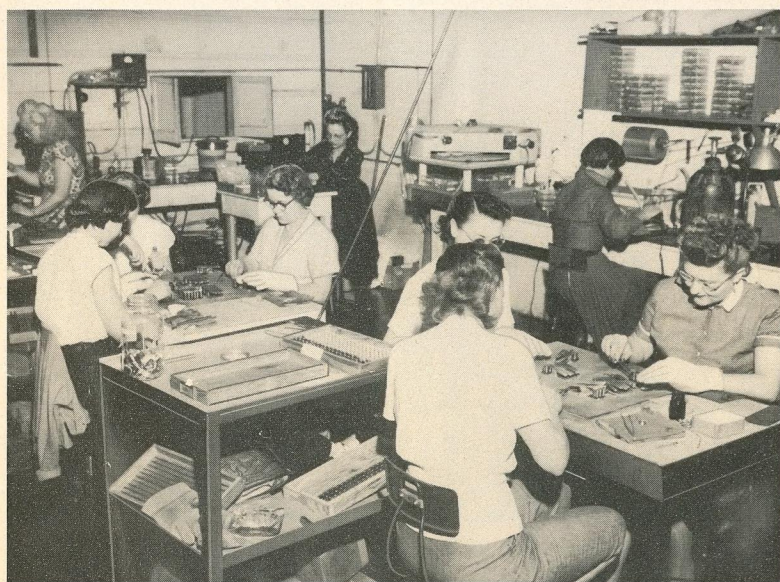
standing of the pathology will guide the experienced physician in determining the correct intensity. The Medi-Sonar ultrasonic apparatus is especially designed by careful study of professional needs to give accurate and reproducible ultrasonic outputs.

G. Frequency:

Patients with acute or sub-acute conditions can be treated daily or every second day. Patients with chronic or sub-chronic conditions may be treated weekly.

7. Is ultrasonic energy dangerous?

In the hands of the physician ultrasonic energy is not dangerous. There is no doubt that the biologically highly active form of energy of ultrasonic waves present some dangers in their clinical application. However, in the experienced hands of the practitioner, modern ultrasonic apparatus with



Assembly operations of crystal blanks.

CALIBRATION CHART FOR MODEL 3000 MEDI-SONAR AT 115 VOLTS FOR MEDI-SONAR SER. NO. 3015 — EFFECTIVE AREA 12.56 Cm²

1000 Kc — Head No. 1026			3000 Kc — Head No. 3031			
TOTAL OUTPUT OF EFFECTIVE AREA		OUTPUT W/cm 2	TOTAL OUTPUT OF EFFECTIVE AREA		OUTPUT W/cm 2	
DIAL SETTING	1	5	.40	1	3.75	.30
	2	11	.88	2	6	.48
	3	16	1.27	3	9	.72
	4	22	1.75	4	12	.96
	5	28	2.23	5	15	1.19
	6	33	2.63	6	19	1.51
	7	38	3.03	7	22	1.75
	8	43	3.42	8	26	2.07

fine control of energy output will minimize these potential dangers. Avoid soundings of:

1. Malignant tumors
2. The heart and the stellate ganglion in cardiac cases
3. Developing bones in children
4. The eye
5. Pregnant uterus
6. The spinal cord
7. The gonads
8. Subjective pain reported by patient during treatment should not be ignored as it is a sign of too high intensity level.
9. Usual precaution regarding patients with pathology affecting voluntary sensory effect should be taken.

8. What are the biological effects of ultrasonic energy?

1. The mechanical effects in cell size matter as previously described.
2. Chemical effects.
3. The neurotropic effects.

**OTHER DALLONS
QUALITY PRODUCTS**



THE 1600A "MEDITHERM"

AMA APPROVED



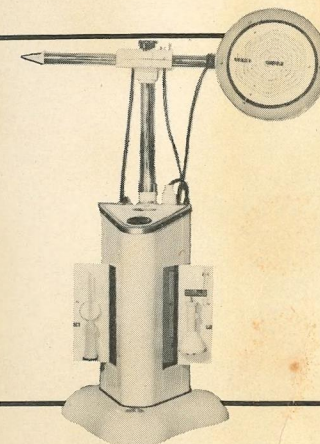
APPROVED

F.C.C. APPROVED

THE "600" MEDIQUARTZ

**PROFESSIONAL
U. V. LAMP**

AMA APPROVED



- **PORTABLE SURGICAL UNITS**
- **"MEDI-SINE" GALVANIC UNITS**
- **"MEDIQUARTZ" GERMICIDAL LAMPS**
- **"MEDIQUARTZ" ORIFICIAL UNITS**
- **WALL MODELS AND PORTABLES**

DALLONS LABORATORIES INC.

LOS ANGELES, CALIFORNIA