This invention relates to improvements in devices for mixing and vibrating compositions of matter in the preparation thereof for use and more particularly to a combined vibrator and mixer unit for treating dental investment compounds and other plastic substances used in the practice of dentistry.

An object of the invention is to provide a combination device of the character described which, as a single, simply constructed, comparatively small and compact unit, will facilitate the mixing and deaeration of investment compounds and other dental plastic substances.

Another object of the invention is to provide a combination vibrator and mixer unit of the character described in which the mixing and vibrating mechanisms are simultaneously actuated from a common operating shaft to provide for simplicity of structure and arrangement as well as to minimize the number of working parts and permit of a simultaneous mixing and vibrating of the substances to be treated.

A further object of the invention is to provide a combination mixer and vibrator of the character described in which the mixing and vibrating mechanisms are closely related in a compact arrangement to provide for a convenient use of either or both of said mechanisms with an economy of space consumption and a low operating cost.

Still another purpose of this invention is to provide in a device of the character described, simple and efficient means for transmitting high speed vibrations to the substance to be treated and thereby provide for a quick and thorough deaeration and preparation of said substance.

It is another object of the invention to provide in a device of the character described a novel means for obtaining an effective and rapid mixing operation which may be utilized at the same time the vibration is in use or independently thereof.

Further, it is an object of this invention to provide a novel combination of the mixing and vibrating mechanisms with a common operating shaft and motor therefor in a compact arrangement which permits of ready access to either mechanism.

This invention also resides in the provision of a novel and effective vibrating table and mounting means therefor which make for high speed vibrations and the effective transmission of such vibrations to the material under treatment.

Yet another object is to provide an improved means for easily and effectively maintaining containers of different sizes with the substance to be treated therein, in proper operative relation to the mixer mechanism as well as the vibrator mechanism.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

Referring to the drawing,

Figure 1 is a fragmentary vertical sectional view of the device of this invention.

Figure 2 is a cross section taken on the plane of line 2—2 of Figure 1.

Figure 3 is a bottom plan view of a part of the mixer.

One embodiment of this invention, as shown in detail in the accompanying drawing, generally comprises an operating shaft which at its respective terminals is connected with and operates agitating mechanisms, which latter include means for maintaining receptacles containing the substances to be treated in operative relation to said agitating mechanisms. One of the agitating mechanisms serves as a mixing device whereas the other serves as a vibrator which deaerates the mixture or substance placed in operative relation thereto. Thus it will be seen that provision is made for mixing dental investment compounds and other plastic substances and for deaerating such compounds or substances with the single, simply constructed unit of this invention which may be installed...
and used with an economy of space and operating cost and wherein the mixing and vibrating mechanisms are subject to convenient use either simultaneously or separately.

The present embodiment of the invention is comprised of an electric motor 5 which is carried by a bracket 6 that may be attached to a suitable support not shown. The motor has a shaft 7 which extends from upper and lower sides thereof. Connected with and operated by the upper end of this shaft is an agitating mechanism 8 which produces high speed vibrations and serves as a vibrator. Another agitating means 9, and which acts as a mixer, is connected with and operated by the lower end of the motor shaft.

Receptacles 10 and 10z, as shown in full lines at the lower end of the device and in dotted lines at the upper end of the device, are provided to contain the compositions of matter to be treated. The receptacle 10 is preferably flexible and usually made of rubber to facilitate the application thereof to the machine as will be later more fully described.

The agitating means 8 is designed to transmit high speed vibrations to the substance placed in operative relation thereto in the receptacle 10z. As here shown, this means comprises a vibratory shaft 12 flexibly supported in a cone shaped housing 13 which latter extends upwardly from and is carried by the motor. This shaft is connected with the motor shaft by an eccentrically arranged ball and socket joint, in which the socket 15 is carried by the motor shaft in off center relation thereto and the ball member 16 is carried on the lower end of said vibrator shaft. The vibrator shaft extends beyond the housing 13 and at its outer end is provided with means for maintaining the receptacle 10z in position to be vibrated thereby. This means is in the form of a plate-like table 17 suitably secured to the outer end of said vibrator shaft. A spiral spring 18 engages between a shaft carried abutment 19 and a supporting member 20 in the housing 13 and thereby resiliently supports the vibrator shaft and table. This spring takes the weight of the vibrator off the ball and socket joint and therefore provides for the undAMPENED transmission of the high speed vibration.

The abutment 19 on the vibrator shaft seats against the inner side of the outer end of the housing 13 in such manner that said shaft will fulcrum at the point of said seat while its ends describe substantially circular or orbital paths. Therefore the table 17 on the outer end of the vibrator shaft is given a swift, swirling or gyratory movement which produces highly effective vibrations for causing deaeration of plastic or other dental compounds placed on said table for treatment.

The agitating means on the lower end of the motor shaft is arranged to provide a thorough mixing action with a rotary movement of mixing vanes or blades 22 and 23 which are fixed to an extension shaft 24 of the motor shaft. This extension 24 passes through a housing 25 similar to the housing 13 and which depends from the lower side of the motor. The housing terminates well spaced above that part of the extension shaft 24 on which the mixing blades are mounted whereby said blades may be disposed with the receptacle 10 in position to mix the material contained in said receptacle.

Means is provided to facilitate the placing and maintaining of the receptacle in operative relation to the mixer. As here shown, this means comprises a circular plate 26 secured by fastenings 27 to the lower end of the housing 25. A thrust bearing 28 for the shaft 24 is provided on the inner side of said plate 26. On the outer side of the plate around the margin thereof is a depending flange 29 which cooperates with a similar flange 30 to provide a receptacle holding space between the flanges. Thus the receptacle is disposed with its upper edge engaged and held between said flanges to maintain the receptacle in proper relation to the mixer. Another flange 31 spaced inwardly from the flange 30 provides for accommodating smaller receptacles. This means permits of a quick positioning of the receptacle against the plate 26 and enables the operator to easily and accurately hold the receptacle in proper relation to the mixer.

I may provide a shield 33 as shown in Figure 1 to prevent the compounds or materials being mixed in the receptacle 10 from getting into and around the bearing 28 as well as collecting on the bottom of the plate 26. A disk 34 fixed on and rotating with the shaft extension 24 may also be employed to prevent accumulation of material on the plate 26 and shaft 24, said disk tending to deflect outward and downward the material thrown against it during operation of the mixer.

A silencer pad 35 may be provided on the table 17 to prevent noises which would otherwise be made during vibration of the receptacle 10z supported on the table.

From the foregoing description and accompanying drawing it will be apparent that the apparatus here disclosed will provide the objects and advantages hereinbefore pointed out.

We claim:
1. In a device of the character described a rotary shaft, a vibrator shaft, and resilient means flexibly supporting said vibrator shaft, an eccentric coupling between said shafts providing for vibration of the vibrator shaft on rotation of the other shaft, and a vibrator table fixed to said vibrator shaft.
2. In a device of the character described
a motor, a support therefor, a motor shaft extending above and below the motor, a mixer means supported on the lower end of and arranged to rotate with said shaft, a non-rotating vibrator shaft extending from and supported on the upper end of said motor shaft, an eccentric joint between said shafts providing for vibration of the vibrator shaft on rotation of the motor shaft, a vibrator table fixed on said vibrator shaft, a housing extending upwardly from said motor, expansion spring connection between said housing and vibrator shaft providing for flexibly supporting the latter in upright position, a housing extending downwardly from the motor, a plate carried by said housing and arranged to be engaged with a receptacle containing the material to be mixed to dispose the receptacle in operative relation to said mixer means.

3. In a device of the character described, a motor, a support therefor, a motor shaft extending from upper and lower sides of the motor, a mixer means connected and arranged to rotate with the lower end of said shaft, a non-rotatable vibrator shaft operatively connected with the upper end of said shaft, means of connection between said vibrator and motor shafts providing for vibration of the vibrator shaft on rotation of the motor shaft, a vibrator table on said vibrator shaft, a housing for the motor and said shafts, resilient means of connection between said housing and said vibrator shaft providing for flexibly supporting the vibrator shaft, and bearing means carried by said housing for the portion of the shaft below said motor.

4. In apparatus of the character described, an upright rotary operating shaft, a support and drive means for and disposed between the ends of said shaft, an agitating member adapted for vibratory movement positioned above said shaft, means provided with a universal joint connecting said member in offset relation with said rotary shaft adjacent the upper end thereof, and a rotary agitating means disposed at and operated at the lower end of said shaft.

5. In testimony whereof, we have hereunto set our hands at San Francisco, California, this 7th day of June, 1929.

THOMAS H. FORDE.
NEWTON W. MELLARS.