MACHINERY AND POWER PLANT ON CONCRETE FOUNDATIONS.

By Norman G. Meade.

OUNDATIONS for machinery have two functionsto keep the latter level, with all parts in alignment, and to absorb shock and vibration. The prevention of vibration is mainly dependent on the weight of the foundation. Individual motors, motor-driven machines, such as pumps, fans, etc., motor-generator sets and booster outfits require various kinds of foundations, the selection being governed by the weight and speed of the machines. The construction of the building in which the machinery is installed also has much to do with the method of support. For a given horse-power the support or foundation for a motor depends a great deal on the speed, and if belted, on the pull on the belt and the belt angle. Motors mounted on columns or walls are liable to cause trouble from vibration, and where possible it is best to mount them on the floor.

Where vibration is not objectionable, small machines may be mounted on a timber frame bolted to the floor. It is ordinary building practice for stores, factories and



warehouses, to design the floors to sustain a weight, in addition to the weight of the floor, of about 150 lb. per sq. ft. Where the floors are constructed of wood and vibration is objectionable, small motors, say, up to 10 h.p., may be mounted on a spring base, consisting of two timber frames approximately the size of the motor base, separated by helical springs at the four corners. The lower frame is bolted to the floor and the motor base is fastened to the upper frame by coach screws. The safe carrying capacity of a helical spring may be determined from the following formula:

$$W = 11,781 \frac{a^2}{R};$$
 where

W = safe carrying capacity in pounds;

- d = diameter of rod material for spring in inches;
- R = mean radius of coil (*D*-*d*, where *D* is the outside diameter of the coil).

Assume a spring where d = 0.5 in. and R = 2 in.; then 0.5^{*}

W = 11,781 - 736 lb. Four springs of like

dimensions will support a weight of 736×4 = 2,944 lb.

Obviously the other factor of the formula can be found by transposition.

For mounting machinery on concrete floors a good foundation is made as shown in Fig. 1. A wooden framework of 6×6 -in. timbers bolted together is secured to the floor by bolts and is filled and surrounded with concrete. The height of the concrete should equal that of the framework.

On first floors of buildings where the distance to the earth is small, regulation concrete foundations are advisable. Concrete is comparatively inexpensive, is lasting and will support from 4 to 15 tons per square foot. The stones used in the concrete should not exceed 2 in. in any direction, and the particles should not be too uniform, as the smaller pieces fill up between the larger ones and the sand and cement fill the voids.

Excavations should extend below the frost line and should be filled in for about 6 in. with well-tamped sand if the location is dry, but if surface water is likely to percolate into the excavation a layer of gravel about a foot thick should form a base for the concrete. A form for a concrete foundation is shown in Fig. 2. It consists of wooden planking attached to battens which are braced against the sides of the excavation.

Good proportions for concrete using Portland cement are: Cement, 1 part; coarse sand, 2 parts; broken stone, 5 parts. The ingredients should be thoroughly mixed dry, and after mixing add just as little water as will completely wet the material. Concrete should be placed carefully. It should be thoroughly rammed in from 6 to 9-inlayers, and after setting, the top of each layer should be cleaned, wet and roughened before placing another layer. The weight of good concrete per cubic foot dry is from 130 to 160 lbs. If the earth is firm and dry in the excavation, the wood forms may be omitted, as filling out the inequalities makes the foundation much firmer.

There are numerous ways of placing foundation bolts, but it is always well to have an open space around them so that they may be sprung somewhat to enter the holes in the machine base. A good way to accomplish this is to place the bolt in an iron pipe about twice as large in inside diameter as the outside diameter of the bolt.

Foundation bolts should be in concrete foundations to a depth of at least fifty diameters. The diameter of the bolt should be the diameter of the hole in the bedplate less about one-sixteenth of an inch. Where foundations are deep enough, it is well to locate the anchor plate and nut in a pocket in the concrete above the ground level, as shown in Fig. 3. This permits removal of the bolt if necessary.

After the foundation is completed and set, the machine should be placed in position over the foundation bolts and carefully levelled by means of two wedges placed together on at least each of the four corners as shown in Fig. 4. Levelling is accomplished by hitting the upper wedges with a sledge. When level, the space between the under side of the base-plate and the foundation should be well grouted.—"Power."

RUSSIAN TRADE REQUIREMENTS.

A Canadian, who for many years has been in charge of important machinery interests in Russia, says that the principle of firms combining in groups or syndicates in order to work the Russian market is a good one, but those who want to make a success, must go over and investigate for themselves. Doing business direct from Canada is of little avail. In any case catalogues in Russian, and in the weights and measures and currency of the country are indispensable.