The same effect is also produced by the suspension of the loading platform 10, which does not require to be rotated together with the piston. The vertical position of cylinder 2 is attained by setting screw 11. Owing to its free suspension, the loading platform always takes up a position in which the center of gravity of the load is on the same axis as the piston, thus decreasing considerably the possibility of distorting the piston.

The low suspension of the loading platform provides the possibility of loading it with 200 kg and, if required, even considerably more. This loading makes it possible to increase the piston diameter by a factor of 5-10 as compared with a normal loading system. The manufacture with sufficient accuracy of a piston with a cylinder 10 mm in diameter does not present any considerable difficulties.

The cylinder and piston are made of grade 12Khn3A steel with surface cementation and hardening to 52-56 on the Rockwell scale. The piston is fitted to the cylinder with a gap not exceeding 0.005 mm.

When gas pressures are measured, a diaphragm differential manometer and a mercury regulator are used for separating the gas from the oil. The diaphragm differential manometer type DM-6 is very convenient for a rough selection of loads, since it registers large one-sided overloading. The mercury regulator is convenient for precise adjustment of the load. The regulator consists of a U-shaped short differential manometer, made of stainless steel and supplied with a valve which separates the two branches of the tube. The branch connected to the gas line is equipped with an electrical contact which registers the mercury level; when the level reaches the contact, a signal lamp lights. The electrical contact is insulated from the body of the instrument through a plexiglass bushing placed over a self-tightening tapered fitting.

Small mercury level variations due to temperature changes or other reasons are compensated by changes in the valve opening. Experience has shown that the sensitivity of the regulator as a null-indicating device is 1-2 g.

Thus, the above pressure gauge, together with the mercury regulator provides the possibility of establishing equal pressure in gas and oil pipes with an error of about 0.008%, and of measuring the absolute value of pressure with an error not exceeding 0.02%.

LITERATURE CITED


MEASURING THE TORQUE OF DRIVING SHAFTS


Transportation by means of belt conveyors is becoming more and more widely used in coal mines.

One of the important questions in the complex investigations required for finding methods and means of improving the parameters and the technical and economic possibilities of belt conveyors is the measurement of the torque of the conveyor-belt driving drums.
Methods of measuring torque by means of resistance transducers which are glued to the shaft and connected in a bridge circuit [1] and by means of torque meters [2] are sufficiently well known and familiar. In both instances, the signals are amplified and recorded on an oscillograph film.

Under the working conditions in a mine, it is practically impossible to glue, dry, and calibrate the transducers on the driving shafts of the drums without a prolonged stopping of the operating conveyors. Moreover, the experience gained by us in the Krivbas mines shows that it is simpler and more reliable under coal mine conditions to measure without using amplifiers.

In this connection a new torque meter has been developed and tested out for measuring torque of driving drum shafts on underground belt conveyors of types RTU-30, LKU-250, and KRSh-220, by means of fixing the meter on the sprockets of the drum chain drive after the chain has been removed. The torque meter (Fig. 1) consists of two dismountable disks 1 and 2 with grasps 3 and 4, between which a special electric strain-gauge torque meter 5 is placed. The transducer slip-rings 7 are fixed to one of the disks by means of screws 6. The slip-ring brushes are fixed in a permanent position on the lid of the reducing gear. The construction of the unit makes it possible to fix it rapidly without altering the driving mechanism, which is very important when studying operating conveyors.

In order to be able to record efforts without using an amplifier, it is necessary to have "powerful" electric strain-gauge transducers, i.e., transducers whose signals would operate the most sensitive vibration oscillograph MPO-2.

Recently, such electrical strain meters with "powerful" signals have been developed and tested out. Such meters include those of the potentiometer type [3], those with resistance wire transducers coiled inside a tube [4], and those of the dynamometer type [5]. The over-all dimensions requirements prevent the use of the first two types.

The defects of a dynamometer-type transducer made and tested by us consisted of the nonlinearity of deflection of the beam with respect to the measured effort, and the difference of readings when loading or unloading.

In trying to find a better construction, we made and tested dynamometers consisting of resistance wire transducers glued to organic glass. Tests of these dynamometers showed that the very small deformation tolerances of organic glass due to the elastic aftereffect [6], required many more transducers than steel formers for the production of a strong enough signal. This circumstance causes certain difficulties in the manufacture of the dynamometers and in subsequent testing with them.

In research work electrotensometric dynamometers are used with amplifiers [7]. We used similarly constructed dynamometers.

Their essential difference from the existing type of dynamometers consists in having four parallel groups of resistance wire transducers glued to the ring and connected in a bridge circuit, thus obtaining the required power for recording by means of a vibrator without an amplifier. We made dynamometers from 40KhN steel rings 40 mm wide, with an external diameter of 80 mm and an internal one of 74-40 mm, intended to take loads of 200-10,000 kg-wt. For convenience of applying the load to the ring, it is supplied with two collars.

The resistance transducers are made of constantan 0.05 mm wire, they have a base of 17 mm and a resistance of 47.5 ohms each. A transducer group (arm of a bridge) consists of four such specimens connected in parallel. All the transducers are operative. The total bridge resistance is 12 ohms. The bridge operating voltage is 8 v.