new war, has won for our party and the Soviet government
the profound esteem and gratitude of the entire progressive
part of mankind. The peoples inhabiting our planet en-
thusiastically hail the outstanding victories of Soviet science
and technology in the conquest of outer space.

The Soviet people welcomes the 22nd Communist Party
Congress by offering the Fatherland the gifts of its
labor. The first half-year plan for 1961—the third year
of the septennial—was successfully fulfilled. Comrade
N.S. Khrushchev in his radio and television speech on
August 7, 1961 said that in the two-and-one-half years of
the septennial the industry has turned out 15 billion roubles
worth of goods more than scheduled for this period of the
seven-years plan. The surplus production includes 7.6
million tons of steel and 6 million tons of rolled stock.

The 22nd CPSU Congress will approve the grandiose
peaceful plans of our future life. It will make a priceless
contribution into the great repository of the eternally
living and continuously developing creative doctrine of
Marxism-Leninism. The Congress will enter into the
history of our party and our country, into the history of
the struggle for a brighter future, for the happiness of
mankind, for communism, as one of its most luminous
and glorious pages.

HEAT-RESISTANT STEELS AND ALLOYS

OBSERVATION OF THE MECHANISM OF FAILURE IN SHORT-TIME TESTS
OF AUSTENITIC STEELS AT 1100°C

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This report gives the results of an investigation of the
failure of specimens of two steels—EX18H9 and 4X14H14B2M—
during tension under constant load at a temperature of 1100°C
in vacuum. The time to failure was 3–30 minutes.

The composition of steel EX18H9 was: 0.07% C; 18.0% Cr;
9% Ni; 1.56% Mn; 0.31% Si. The composition of steel
4X14H14B2M was: 0.45% C; 14% Cr; 15% Ni; 2.3% W; 0.6%
Mn; and 0.34% Si.

Fig. 1 shows a specimen (a) and the arrangement (b) of
the indentions made by a diamond pyramid on its polished
surface prior to testing. The indentations were made along
the axis of the specimen at intervals of 50μ and served as
a basis for determining the amount of deformation during
the experiment. The field of vision of the MVT microscope
was such that about 10 indentations could be seen simul-
taneously.

In order to conduct the experiment, some of the elements
of the IMASh-5M unit [1, 2] were modernized. In order
to increase the sensitivity of the loading system, the unit
for transmitting force from the lever to the upper clamp of
the specimen was changed.

The new elongated tombac-alloy sylphon of small diam-
eter (replacing the previously used shorter one with large
diameter) increased the mobility of the system transmitting
the load to the specimen. The influence of variations in
atmospheric pressure on the total load applied to the speci-
men was reduced.

Fig. 2 shows the modernized operational chamber of
the IMASh-5M installation. The evacuated chamber (1) is
fastened to the frame (2). The pull rod (3) of the loading
system is connected via the sylphon, which is covered by
a protective jacket (4), with the clamp holding the head of

Fig. 1. Specimen used for testing
on IMASh-5M installation.
Fig. 2. Vacuum chamber with "KONVAS" motion-picture camera.

The sample. A metallographic microscope (5) is installed on the lid of the vacuum chamber. The tube of the microscope is moved by handles (6). The macro and the micro settings are obtained with handles (7). The "konvas" motion-picture camera (8) is fastened to the tube by a socket (9).

In view of the aims of the investigation it was necessary to reduce the speed of the motion-picture camera to 12-120 frames per minute. For this purpose we employed a time-delay drive, the shaft of which (10) is coupled with the mechanism of the motion-picture camera.

The temperature of the specimen was automatically regulated and controlled by an electronic potentiometer (11), accurate to ± 0.5%. The residual pressure in the chamber was measured by T-2 and M-2 manometers, located on the lid of the chamber. The manometers were covered by the jacket (12) and connected with a VIT-1 vacuum-meter (13).

At a temperature of about 1100° considerable vaporization of the metal specimen takes place. Condensation of the evaporating particles on the quartz-glass viewing window excluded the possibility of prolonged observation or motion-picture filming.

In order to counteract this effect, the vacuum chamber was provided with a special arrangement (Fig. 3). Between the specimen (1) and the viewing glass (2), set in the lid of the vacuum chamber (3), an immovable shield (4) was placed, in the form of a plate made of molybdenum sheet of 0.3-mm thickness. This plate was provided with a rectangular slit (5). Between the shield and the window we placed a movable strip (6) with a plane-parallel quartz glass (7). The strip (6) could be shifted by a lever (8) and handle (9), through a tapered ground stopper (10), fastened against the lid of the chamber by a cap (11) and spring (12). The degree of shifting of the protective (7) within the chamber was regulated with the aid of a scale (13).

For observation of the microstructure of the specimen, an MVT microscope was used, provided with an objective-lens system (14) of the OSF-16 type (with a working distance of 15 mm).

During the test the strip (6) is gradually shifted, depending on the amount of condensation on the portion of the quartz glass (7) opposite the slit (5). This provides an opportunity for observing the microstructure of the specimen through the clear parts of the quartz glass.

The entire batch of specimens (40-50) of each steel was sealed in a quartz ampule, which was evacuated to a pressure of about 10⁻⁴ mm Hg. Then the ampule was heated in a furnace to 1160°C and held at this temperature for 2 hours. The ampule was then broken over an oil bath. Polished areas were prepared on the surface of the quenched specimens, revealing their microstructure. The samples selected for the test were specimens of steel EX18H9 (with an average grain diameter of 30-60µ) and steel 4X14H14B2M (with grain diameters of 100-130µ).

A series of specimens with approximately the same average grain size were subjected to tension in a vacuum at 1100°C under various loads. On the average, five successive tests were made for each load. The amount of the load was so chosen that the time to failure would be 5-30 minutes.

Fig. 3. Diagram of arrangement for preventing condensation on main viewing glass of vacuum chamber of IMASh-5M installation.