CWS:LTQ
VIII-5

DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
WASHINGTON

Letter
Circular
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SINTERING TEST OF MOLDING SAND

The true melting point of a molding sand, as observed by the full fusion of a cone or by other means, is not the only property upon which the practical "refractoriness" of the sand depends in foundry use. It is of more importance, to the foundrymen, to know the lower limit of the fusion range, that is the temperature at which the sand sinters and "burns on" the casting, thus making cleaning difficult.

As a means of determining this lower limit or sintering point the following method, described below, has given satisfactory results:

Preparation of Samples

The sample to be tested should be an average one, representative of the heap, floor, car, bank, or other sources from which it is taken.

In carrying out the sintering test it is necessary that the sand be properly sampled and uniformly tempered. For plant check or control tests upon facing or heap sands in daily use, one may test the sand as tempered for molding.

The preparation of the sintering test specimen does not differ in any way from the preparation of the standard American Foundrymen's Association permeability specimens,

except that the specimen is removed from the cylinder in which it is rammed and sufficient sand is cut away from the specimen along its length to leave a test piece 2 inches long 2 inches high and 1 inch thick. Specimens should be dried at least 1 hour at a temperature not lower than 105 degrees centigrade nor higher than 110 degrees centigrade.

Sintering Apparatus

The assembly and detail of the sintering apparatus are shown in Fig. I. The assembly of complete set-up is shown in photograph Fig. II. Sintering apparatus (A), See Fig. I, carbon-plate resistance (B) 1000 watts, approximate range of resistance .04 - 4 ohms, length 18 inches, width 6-1/4 inches, height 7 inches; ammeter (C), range 50 amperes; optical pyrometer meter (D); optical pyrometer (E); light proof cabinet into which sintering apparatus (A) is placed when conducting tests; interval timer (G).

Procedure of Sintering Test

The sand specimen is placed in position in the sintering apparatus under the platinum ribbon heater (H, Fig. II). The specimen is centered between the platinum ribbon holder terminals and the platinum ribbon is placed in contact with the rounded surface of the sand specimen, allowing the weight of the platinum ribbon holder unit to be the applied load.

The optical pyrometer is sighted on the central point of the platinum ribbon and adjusted to read the observed tempera-

ture starting with 923 degrees centigrade as shown in the table below:

Table

Temperature Corrections
for
Emissivity of Platinum

°C Observed	°C True
923	1000
945	25
967	50
989	75
1011	1100
1033	25
1055	50
1076	75
1098	1200
1120	25
1141.5	50
1163	75
1184	1300
1205.5	25
1227	50
1248	75
1269	1400
1290.5	25
1312	50
1333	75
1354	1500

Use Absorption Glass Above 1320° True. Temperature.

Opposite the observed temperatures are the true temperatures secured by correcting the observed temperatures for the emissivity of platinum. An electric current is passed through the platinum ribbon and by adjusting the carbon plate resistance the brightness of the platinum ribbon is made to match the brightness of the filament in the optical pyrometer which has been set at 923 degrees centigrade observed temperature, or 1000 degrees true temperature. This accomplished, an interval timer or stop watch is started and the heated ribbon is allowed to remain in contact with the sand specimen for a period of four minutes, the electric current is then turned off and the platinum ribbon raised from the specimen, noting whether or not the ribbon has burned fast to the sand specimen. If the platinum ribbon has not burned fast, the specimen is moved forward about one-half an inch and the platinum ribbon again is placed in contact with the specimen. The above procedure is repeated, only this time, increasing the true temperature by 25 degrees. This corresponds to an observed temperature of 945 degrees or 1025 degrees true temperature as shown in the table. The above procedure is repeated each time increasing the temperature by 25 degrees true temperature until the platinum ribbon has burned fast to the sand specimen. The true temperature at which this takes place is the sintering point.

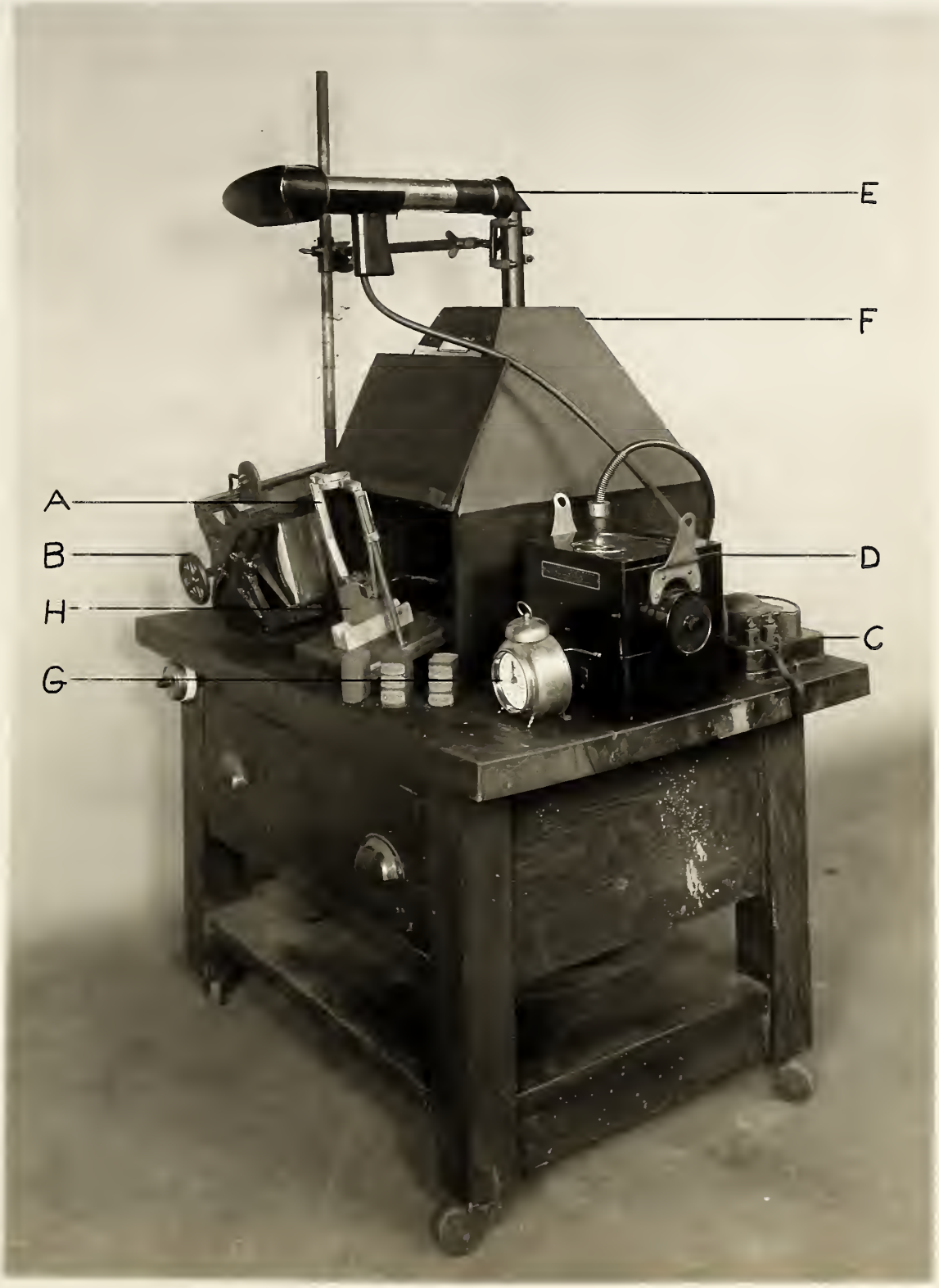
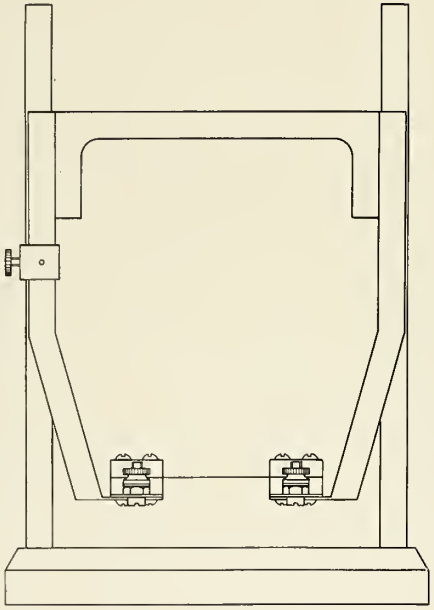
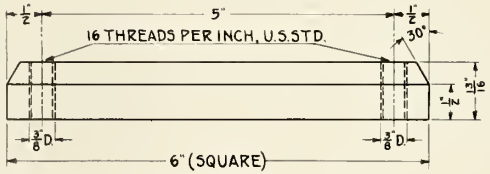


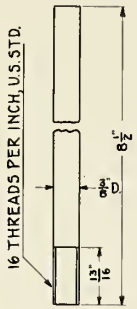
FIG. II



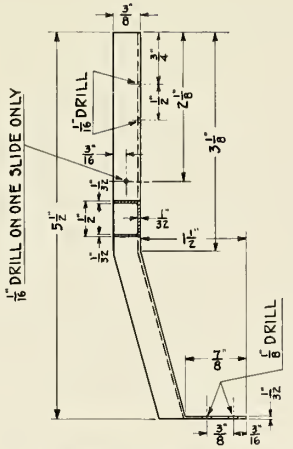
ASSEMBLY



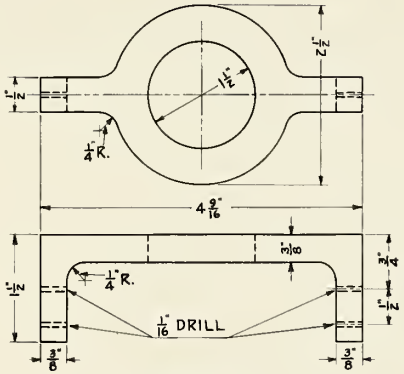
BASE
ONE-HARDWOOD
(OAK)



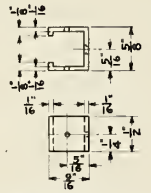
SLIDE POST
TWO-STEEL



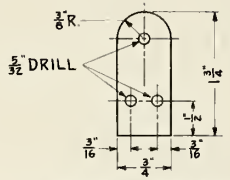
SLIDE
TWO-ALUMINUM SHEET
(22 U.S.STD. GAUGE)
4-1/16" RIVETS, 3/32" LONG



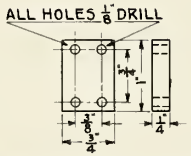
YOKE
ONE-HARDWOOD
(OAK)

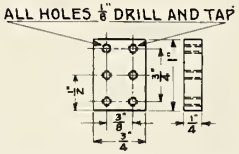


RETAINING CLIP
ONE-STEEL
1-1/8" KNURLED SET SCREW, 1/4" LONG
2-1/16" RIVETS, 3/32" LONG



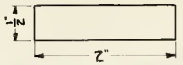
ELECTRICAL CONNECTION
TWO-BRASS SHEET, 1/32" THICK
2-3/32" SCREWS, 1/2 LONG
2-5/32" NUTS
2-5/32" WASHERS
2-3/32" KNURLED NUTS





RIBBON HOLDER-UPPER HALF
TWO-COPPER

RIBBON HOLDER
LOWER HALF
TWO-COPPER
4-1/8" SCREWS, 1/2" LONG
2-1/8" SCREWS, 1/4" LONG



RESISTANCE RIBBON
ONE-PLATINUM .001 INCH THICK

SAND SINTERING
APPARATUS
ASSEMBLY & DETAILS SCALE-FULL SIZE
APRIL 7, 1928.

FIG. I