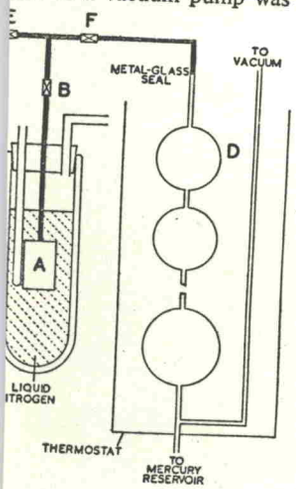
he pipette was adjusted to the desired
sealed by closing the needle valve B.
re system and opened to the gas burett
lines. After this had been done the b
cury and the gas enclosed in the pipett
ined at constant temperature in an oil
mercury manometer. From volume
number of moles of gas initially enc
ty at the high pressure calculated. Th
correction was applied in these measure
yostat temperature.
containing liquid nitrogen and fitted w
onnecting line to the pipette. Tempera
mometer in a pocket immersed in the l
tion to a vacuum pump was also pro




gram of apparatus.

d so obtain temperatures below the nor

aling the gas pipette be outside the cryo
portion of the enclosed gas was approx
of the cryostat. Care was taken to ens
le; it was about 10 % of the total. T
each density determination and the num
from the compressibility data of Mic
o find the number of moles at the cryo

ction of this volume which was immer
ensions of the apparatus. These volu
me measurements of the compressibi
f Michels and Goudeket [7] and of Johns

erg standard test gauges of the Bour
fficient for the purpose of the investigati
rified by the method of Hainsworth a
at a pressure of 100-150 atm through
110° C and then through a steel trap i
ressor.
by a method similar to that used by Sc
was immersed in Dry Ice and alcoh
It was next opened and 50 ml of D



duced. The reactor was closed and returned to the Dry Ice bath for about 20 min ure "deep freezing" of the $D_2O$. After this period it was opened and 100 g of calcium gs added. The vessel was again evacuated, then sealed and the Dry Ice bath re- d. After a short while an extremely rapid exothermic reaction took place, the pressure to 100 atm in about half a minute. The deuterium was then passed at about 40

TABLE 1.—ISOTHERMS OF HYDROGEN

| $T = 64{\cdot}5°$ K | | $T = 78{\cdot}9°$ K | |
|---|---|---|---|
| pressure (atm) | density (mole cm$^{-3}$) | pressure (atm) | density (mole cm$^{-3}$) |
| 350 | 0·0344 | 300‡ | 0·0299‡ |
| 500 | 0·0387 | 500 | 0·0358 |
| 790 | 0·0440 | 600‡ | 0·0385‡ |
| 1000 | 0·0467 | 700 | 0·0404 |
| 1250 | 0·0493 | 800‡ | 0·0422‡ |
| | | 950 | 0·0442 |
| | | 1250 | 0·0478 |

‡ measurements using hydrogen prepared by reaction of $H_2O$ with calcium.

TABLE 2.—ISOTHERMS OF DEUTERIUM

| $T = 64{\cdot}5°$ K | | $T = 78{\cdot}9°$ K | |
|---|---|---|---|
| pressure (atm) | density (mole cm$^{-3}$) | pressure (atm) | density (mole cm$^{-3}$) |
| 150 | 0·0265 | 150 | 0·0215 |
| 200 | 0·0296 | 200 | 0·0258 |
| 300 | 0·0348 | 300 | 0·0313 |
| 350 | 0·0369 | 350 | 0·0335 |
| 400 | 0·0381 | 400 | 0·0352 |
| 500 | 0·0408 | 500 | 0·0380 |
| 700 | 0·0446 | 700 | 0·0424 |
| 900 | 0·0474 | 900 | 0·0456 |

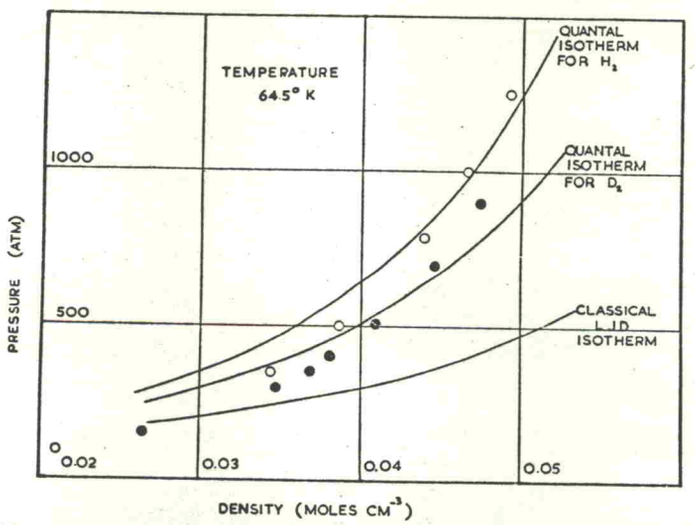



FIG. 2.—Theoretical and experimental isotherms at 64·5° K. The open circles are the experimental points for $H_2$, the filled circles are for $D_2$.

atm through a liquid nitrogen trap into the gas compressor. It is, perhaps, noteworthy hat Schiff and Steacie [10] carried out the reaction at 260° C; in our case the reaction tarted while the reactor was still below 0° C. A few density measurements were made n a sample of hydrogen prepared by the same method, using $H_2O$ instead of $D_2O$.