founded upon a low lying site, flat, and often flooded by
the river; here the rock, which has a westward dip, is
35 ft. below high water, and is covered with 5 ft. of
gravel, with 27 ft. of marshy mud superimposed. In
the centre of the river, where the pier is erected, there
is but little mud accumulation, owing to the water sour,
and it was ascertained by sounding that there was a
comparatively level rock bottom with 8 ft. of gravel
above. Thus but few natural obstacles had to be over-
come in the construction of the foundation, a firm
bottom being accessible close to the surface, except
on the site of the western abutment. The whole of the
masonry was erected within cofferdams, that for the pier
consisting of a crib put together on shore, floated into
position, and sunk. On the eastern side as much earth
as possible was excavated before the cofferdam was
placed. This was about 87 ft. wide, 23 ft. deep, and
9 ft. thick, constructed with wings which fell back
angularly for 50 ft. into the shore; the body of the dam
was of bals cleft laid, and secured with ties placed 8 ft.
 apart, dovetailed into each course of timber. A complete
system of internal bracing connected the inner and outer
shells of the dam, and stiffened it to resist the external
pressure. The wings were of sheet piling. The puddling
employed throughout was clay and gravel, and the dam,
which was carefully put together, leaked but little, even
at high tide, when there was a head of 20 ft. pressing
against the outer side. The rock was benched out in
three steps (Fig. 1), the back being 5 ft. higher than the
face. In preparing the foundations for the western
abutments, a somewhat more complicated process was
imperative, owing to the great accumulation of mud,
and over the whole area to be occupied from the river
front to the face of the first land arch (Fig. 1), piles
were driven; it was intended to use homlock for this
piling; but with that timber it was found impossible to
penetrate the compact stratum of gravel above the rock,
and oak was therefore substituted. In such places where
the rock could not be reached, a maximum settlement
in each pile, of three-quarters of an inch, beneath the
blow of a 1200 lb. hammer, falling through 20 ft., was
adopted as a limit of safety. After the piles were
 driven, a cofferdam similar to the one just described
was constructed around them, and, with the exception
of the four front rows, all the pile heads were cut off at
a level of 2 ft. below low water, those in front being cut
down 4 ft. lower. The mud was then cleared away to a
depth of 2 ft. 6 in. below the reduced pile heads, and
the area was filled with béton, consisting of coarse gravel,
sand, and stones set in cement. This was carefully
levelled, flush with the pile heads, across which oaken
cills, 12 in. square, were laid laterally. The spaces
between were filled with grouting, and a second series
of cills were laid at right angles to the first, and upon
them. This second row consisted of 12 in. square hem-
lock bals, placed 15 in. apart from centre to centre,
countersunk 3 in. upon the oak cills and bolted through
to the pile heads beneath. The spaces left were again
grouted, and upon the platform thus made the masonry
was commenced. Three hundred and seventy-eight feet
of the western abutment and approach retaining walls,
together with the pier supporting the land arches, is
carried upon piling and cill platforms in the same way.
On the eastern side the first portion of the approach is
on gravel; but between Twenty-fourth-street and the
land arches piling has been employed. The piles generally
are driven 2 ft. 6 in. apart, centres, and on the western
side 397 were employed for the main abutment, and 194
in the retaining walls. Altogether about eight miles of
piling were driven in forming the foundations. The
pier was erected upon a crib, made of carefully squared
yellow pine bays. It is 28 ft. high, 86 ft. 6 in. long at
the base, and 31 ft. wide. Seven feet beneath low water
it is 79 ft. 6 in. long, and 24 ft. wide, decreasing with a
regular batter all round from the base. At the first-
named level there is a set-off of 1 ft. on each side, and
the crib is continued up plumb for 5 ft., the top being
3 ft. 6 in. under low-water level. In plan it is divided
into 66 cells, having 17 courses crosswise, and 8 courses
lengthwise (Figs. 4 and 5). The greater portion of
these cells are open to the river bottom, only a sufficient
number having been platformed to contain the sinking
weight which is placed on the second tier from the
bottom. Each course of timber was notched and bolted
to prevent lifting or sliding, and laid together with great
care and precision. It was built alongside of its per-
manent site, and loaded as the work progressed, so that
its top was always level with the water. Before sinking
the crib, the rock upon which it was to be placed was
cleared of gravel by dredging, and a frame corre-
responding to the underside of the crib, showing the position
of the longitudinal and cross timbers forming the cells, was
floated over the site of the pier, and accurately anchored.
From this frame soundings were taken along each line
of timber to the rock, the height of water being regis-
tered at each sounding, and the level being reduced to a
common datum gave an accurate contour of the whole
area of the rock foundation. With these measurements
the bottom of the crib was constructed to conform, in
order that, when got into place, it should have a fair and
uniform bearing over the whole surface, and preserve a
level surface on the top for the masonry.
When the crib was completed, it was floated into
position, the absolute centre being defined by a wire
stretched across the river from abutment to abutment, in
the centre line of the bridge, having a plummet hanging
at the middle. Uprights were placed at the upper and
lower ends of the crib, ranging with the exact centre,