

N^o 764 Dy 14-8-94

N^o 764 D of 14-8-'94

Memorandum

The Chief Engineer
has the honor to request
that the Supt. Engineer
will be so good
as to submit an emergent
indent on the Secretary
of State for iron work
required for sluices for
the Perijan Project.
The estimated cost may
be taken at £60.

*Smt. to L. for analysis
5-11-95.

2. The specifications
and drawings are being
forwarded direct from
this office to the Dir.
Genl of Stores, India
office London.

3. The stores will be shipped to the
port of Madras

S. E. L. C. ✓ D 14/8

N^o 763 D of 14-8-'94

D 14/8

N^o. 763 D of 14 - 8 - '94

To,

The Director General
of Stores, India Office
London.

Sir,

I am directed to
forward herewith a
tracing and specification
of certain iron work —
urgently required in
connection with the main
services of the Berjeux
Project.

2. A formal indent
will be submitted —
shortly, but it is desirable
that no time may be
lost in the despatch of
the articles in question
and the plan and
specification are
therefore forwarded

in advance.

3. The ^{articles} nature of the ~~articles~~ required is fully described in the specifications, and as they are of a simple description I am to suggest that they might be ordered at once from a selected manufacturer so as to avoid the delay of calling for tenders.

4. The articles that are most urgently required are the cast iron standards D and the bars and bolts E of the specification and figs. 7 to 12 of the

Specification of
work to be done in
connection with Perimeter
Tunnel Plans -

Sheet No 1 gives
details of the main
and work work -

All horizontal dimensions
are referred to two
axes named "the centre
line of the tunnel" which
is as its title denotes, as
near as possible the
actual centre line, and
"the centre line of
curves" which is at
right angles to the
"centre line of the tunnel"
and, as nearly as may
be, is set from the
southern face of No 1
shaft -

The work to be removed
shown in the drawings

except that in place
 of the groove with its
 sill at 99. shown in
 figures 1 and 3, it
 should be as shown in
 the dotted red line
 on fig 3; only the
 front end face of this
 groove need be made
 smooth, the bottom
 and rear face, as
 well as the slope
 up to the present floor
 of the side tunnel
 may be rough, but
 should follow as nearly
 as possible the line
 shown -

The shaded portion
 at A in fig 1, being the
 portion to be removed
 if necessary to inspect from
 the centre line of the
 culverts, should be two feet
 wide, and not one foot
 as shown; the inner
 and end (or northern) face

of the grooves thus found
 We found quite true,
 the former being in con-
 tinuation of the inner
 faces of the masonry;
 the outer faces of the
 grooves ~~the~~ may be
 left rough -

Wherever smooth
 faces are required in grooves
 the rock, as in these
 and those grooves at the
 bottom of the shaft,
 they may be obtained
 by cutting out the rock
 to a depth more than
 the required dimensions,
 and bringing up the
 faces with cement, if
 this is easier or cheaper
 than dressing the solid
 rock -

The side tunnels are to
 be closed with masonry
 up to a level of 100.00 as
 shown in the drawings -

The inner faces of the
 masonry walls, then

4
found on the parallel
to, and 7'4" from the
center line of the tunnel,
their outer faces the
parallel to and 14'10"
from the same line, each
wall to have an outlet
giving sufficient width with
its sill at 100.00, its
springing at 102.50 and
crown at 103.50.

The inner faces of
these walls they have out
their curb, and to a
minimum depth of one
foot, their outer faces
to level 105.00 and to
a minimum depth of
one foot, and their
top surfaces for a
minimum width of three
feet and depth of one
foot, the of cut stone,
the remainder the
of good rubble or concrete.

The drawing shows the
arches and sides of the
openings of cut stone, but

5
This is not many; the
former may be concrete,
the latter will be cut
out of the solid rock
and may be brought up to
the exact dimensions
marked with cement -

In the cut stone covering
of the upper surface of
each concrete wall is the
cut a groove twelve feet
long / six feet on each
side of the center line
of each) with its bottom
surface at 107.66, and
its inner face at 7'10" from
the center line of the
tomb, ^{and} its outer face
9'1" from the same line;
the greatest care must be
taken that the bottom
surfaces of these grooves are
on exactly the same
level, and that their
inner faces are exactly
parallel to each other,
and the stated distance

6
(15'4") apart, as the
accompanying of the pits of
the main gates depends
on them -

Each grave is the
round at right angles
of two ^{other} ~~several~~ graves. These
are deeper than the
main ones (i.e. being
their bottom surfaces at
107.416), one foot ten
inches long and six
inches wide, the four
sides of each grave being
perpendicular 7'6 1/2" and
9'4 1/2" from the center
line of the tomb, and
5' and 5'6" from the
center line of the walls -

Of the side of the
tomb the same than six
feet from the center line
of the walls, it must be
distanced

built up to that level
as shown in C in figs 1 and 2
to a distance of two feet

from the outer face of the
masonry (17'4" from the
center line of the tomb)

7
and to the level of 111.00,
so as to leave the smooth
and true faces at this
distance (in feet) on each
side of the center line of the
curbs, extending to the
foot from the outer faces
of the masonry, and from
the sill of the curb
(99.00) to 111.00 -

The masonry corners shown
at B, in fig 1 may
be omitted -

In the inner faces of
the masonry the grooves are
to be cut
2½" deep, and 3" high, and
eleven feet long, i.e. to
5½ feet on each side of the
center line of the curbs,
their upper edges being at
106.875 and 104.875, and
their lower edges at 106.125
and 104.125 - The object
is to receive pipes, similar
to those shown, with the
described in connection
with the iron work -

In the outer faces of the
masonry are to be cut the

forms twelve feet long
 (six feet on each side of
 the center line of the
~~two~~ center) two inch
 a half inches deep,
 and three inches high
 their upper edges being at
 104.00 and their lower
 at 103.75 -

Two similar forms are
 to be cut in the face
 immediately under the
 floor of the anchor
 opening, their upper edges
 being at 99.75 and their
 lower at 99.50; if these
 faces are made good by
 cement and not by
 dressing the rock, the ~~forms~~
 can wooden filling
 described below can be
 set in when the cement is
 being laid -

Note; in the drawings these
 forms are shown 1 1/2" deep,
 they should be three inches and
 a half -

9
In cutting the grooves,
to be tightly secured in
a strip of lead work,
three inches by three inches
is a fit fill the groove
and project from its half
an inch beyond the
general face of the
masonry, which is after-
wards to be brought up
to the same plane by
cement plaster -

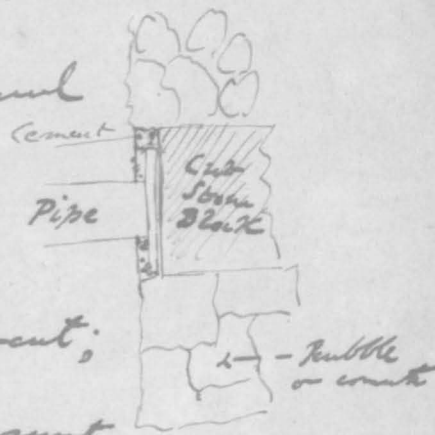
If the face below the
arch is made good by
cement, and not by
dressing the stone, the
wooden strips can be built
in with the cement, which
can be brought out once up
to the flush with the
edges of the strips. What
is wanted is that the
whole inner face should
form one plane, of which the
wooden strips should
form a part -

In the

If cut stone be very
difficult to procure, and

if the execution of the
quantity described above
will involve any serious
delay or difficulty the
cut stone on the two
faces may be omitted,
but a block of cut stone
laid on one face and
not less than one foot
square must be provided
for each pipe to abut

against, and
the pipe
firmly built
in with cement;



the new face must
be faced with rubble, sufficiently
regular to allow the passage
be cut into it, or may be
of fine concrete into which the
strips may be built. The
stone facing shown in the
plans should however be
used if possible. That on
the top of the masonry
must be used in any case -

(11)
Sheet II shows details
of the ironwork required in
the final portion of the
slime.

The main gateways
consist of two openings each
ten feet wide and six
feet high.

The sill of each gateway
is found 3 feet 4 inches wide
each 12 feet long laid
in the longitudinal grooves
in the upper surface of
the masonry, the flanges
of the rails resting on
the bottom of the grooves
at 107.66.

The top of each gateway
is found 3 feet 4 inches
wide with two flanges
at 114.00, built into the
rock or concrete filling
surrounding the gateway.

On each side of the
set of longitudinal rails
forming the floor and roof
of each gateway are two
vertical rails with their
flanges sunk in rock, etc.

12
towards the center line
of the arch, and exactly
five feet from this line.
These lower end of stem
rails rest in the bottom
of the deep grooves in the
masonry 2.c. at 107.416;
^{tops of the}
The outer ones are at about
115.00, of the inner ones at
about 124.00. These rails
are bolted at top and
^{of the opening}
bottom of the wing outlet
rails, & bolts pass through
the webs of all six rails
as shown in Fig 3-

The sides of the openings
are formed of cast iron
struts, as shown in
Fig 5, (and in more
detail in fig 7 to 10
Sheet III) which are
^{fixed}
bolted to the wing outlet
rails at top and bottom
& two sets of bolts, one
wing outlet passing through
the 2" x 2" bars and the
vertical portion of the

13
standards, the other section
passing through the bars
and the flanges of the
standards, as shown in
detail in figs 3 & 5.

These standards and
the bars and bolts
connected with them have
been ordered from England.

The vertical rails on
the two sides of the
shaft are to be connected
by three pairs of joggles
bolted between the
bolts passing through holes
in the webs of the rails
and the flanges of the
joggles, and with their
axes at 112.50, 117.00
and 121.50.

When the above iron work
has been carefully adjusted
in position the grooves
in which the rails rest
are to be filled up with
cement. Fine concrete will

then be run in outside the
iron stanchions, between them
and the rock, and above
the water joining the roof of
the gins; this filling should
be continued beyond the
iron sides and roof as
shown in fig 2, shut II,
and great care should be
taken to make the junction
with the rock a good
one possible -

When the cement grout
is done there will be
a considerable pressure tending
to force the masonry inward,
i.e. toward the shaft,
and to meet this pressure
^{two} ~~the~~ ^{ten} rows of fine pipes
~~as shown in figs 1 and 2~~
are provided - In order
to get these pipes into
the grooves provided for
them they will be let
down in a long vertical
position but oblique to
the center line until
they reach the required
level when they will
be allowed round so as

to enter the grooves; the distance between the outer faces of these grooves is $15'1''$ or one inch more than the length of the pipes; packing plates of sheet iron $5'' \times 7''$ will be driven in between the stone and the flange of the pipes, to fill up this excess, and the whole of the grooves will then be filled in with good cement.

The pipes marked B, C, are distance pieces to keep the mutual guide rails in their places; their flanges also serve as lateral guides for the main rails.

The outer edges of the mutual guide rails are $7'10''$ from the center line of the track, and as the flanges are $3.25''$ wide their inner edges will be $7'6\frac{1}{2}''$ from the center line, or $15'1\frac{1}{2}''$ apart; to fill this space of $1\frac{1}{2}''$ strips of iron 6×4 and $\frac{3}{4}''$ thick will

be placed between the end of
the rope and the edge of
the sail as shown in
Fig 2-

The head of the sail is
1.50" wide and the
flange 2.25"; in order to
secure a strong lining,

between the flange of one
sail cover the head
of another, a packing strip
6" x 2" x .67" (or $\frac{5}{8}$ ") being
put in the difference between
the head and the flange
should be inserted - Two
such strips, both sections
are shown at a, c, fig 2
and two others, one section
the other being cut out, at
b, c, Fig 3 -

Two similar strips, one
one of cloth the other
may be placed at intervals
of three or four feet
between the heads of
the winged sails, if
there is any tendency to
wobble when the flanges

are drawn close together -

The centers of all bolt
holes in the ends of rails
should be $1\frac{1}{2}$ " above the
base of the rail -

The driving nut and washers
to be approximately 12' in
length, so that an ordinary
24' length will cut into
two; they must not
be less than 11'6" - sections
are required in all -

The outer vertical, or
guide rails are ^{to be} fifteen
not less than ^{fourteen} feet
from the inner
one, not less than
seven and a half feet;
and the latter should
not be more than nine
feet - Four of each are
required -

The following are the
bolt holes required for
each rail, and it is
important that the
positions of these should
be exact, as much of the

accuracy of the framing
depends on them.

(2) In the case of the
inner longitudinal ribs
two holes at $5'1\frac{1}{2}"$ from
the center, or $10'3"$ apart,
for the longitudinal bolts
fastening them to the
vertical ribs.

(3) In the outer vertical
ribs, two holes at $4\frac{1}{2}"$
and $6'6"$ from their
lower ends, for the bolts
mentioned under (2).

(4) In the inner vertical
ribs two holes at $4\frac{1}{2}"$
and $6'6"$ from their lower
ends, for the bolts mentioned
under (2) and (3); and
six holes at $4'10\frac{1}{2}"$, $5'3\frac{1}{2}"$,
 $9'4\frac{1}{2}"$, $9'9\frac{1}{2}"$, $13'10\frac{1}{2}"$ and
 $14'3\frac{1}{2}"$ from their lower
ends for the bolts fastening
them to the pipes 22.

All bolts required in
connection with pipes will
be taken from the stock
in hand; all others have
been ordered from England.

The ~~short~~ $\frac{1}{4}$ " plate shown
on fig 4 is for fastening the
main sill from rear, it
is made as the sill
remains when ~~not~~ come out;
the short ~~fastening~~ shown
will be built into
the cement filling between
the ribs and the plate
put down after the latter
has set; it has been
ordered from England -

~~Short~~

The ~~short~~ will be taken
of the "rail for lifting
lower gate" shown on the
drawing, which is not
required, or of the detail
of the lower gate itself
which will be given
separately; at present they
are not altogether suitable -

~~Short~~ ~~III~~ is a copy
of the drawing sent to
England with the order
for the iron work - Figures
1 to 6 refer to the main
gate which consists simply
of a pair of
long plates (15' x 4')

which are to start, first
the 1'6" x 1'6" plates B (fig
5) then the 1' x 1' plates
C (fig 6) and then the
pipes which are in different
pieces - Figs 7 & 10
are the cut iron standards
which form the sides of
the main gutters, and
figs 11 and 12 the bars
for the top and bottom
of the gutters, and
fig 13 the
main plates for the
sills -

Figs 14 & 18 refer to the
gate in the front of the
tunnels -

The total number of
pipes required is thirty
one, namely fifteen for
the main gutters, ten
for the masonry over the
curbs and six for
the guide rails, and it
is essential that they should
all be of the same length,
supposing inequalities of

pint, being made up of
 gushing steps of sheet iron,
 which should be twelve
 inches square for the
 main part, nine inches
 square for the narrow, and
 nine inches of four inches for
 the joint rails -

It is assumed that the
 length is fifteen feet, and
 if the actual length
 is short all the pipes are
 bought shorter from this
 all distances from the
 center line of the trunk
 must be increased or
 diminished by one half
 of the difference -

A gate is required at the
 mouth of the trunk;
 drawings of the gate itself
 will be sent shortly -

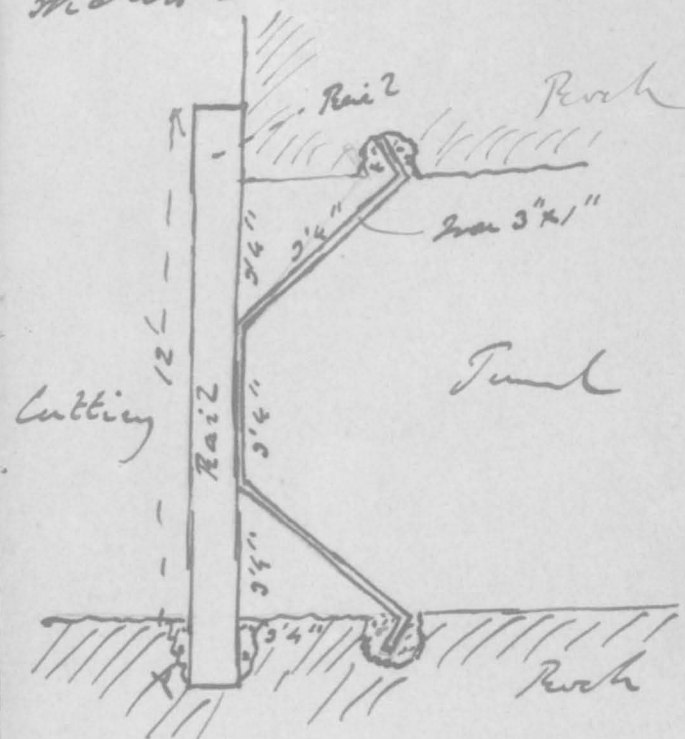
The gate is to be sixteen
 feet high in the center
 with a slightly curved
 top - The sill to be made
 smooth for a distance of

(22)
one post in ~~the~~ front and
run of the gins; and
the face ~~the~~ much
run of the ^{two} for a space of
one foot on each side and
these put above the center
of the opening, i.e. for
a space of twenty feet I
twelve -

Seven rails with their
center then put apart,
the first in a ~~vertical~~ position
in front of the gins, one
on each plank with their
center two inches outside
the gins and the others
at equal distances between
them - The rails ~~the~~ not
less than twelve feet in
length, to be built one
foot into the rock at the
bottom and to run one
foot against the face above
the opening -

The flanges of the rails
the inward, i.e. toward
the tunnel, and the
rails be studded with
iron at ~~iron~~ 5" x 1" as

shown in the following
sketch -



A portion of this structure
is composed of volcanic
plates which can be
removed with great ease,
and which can be used
with advantage for short
periods though their suitability
to get slacked presents their
use for permanent work;
the total effective area
controlled by these plates
is about 50 square feet
which will give a dis-
charge of 5000 ft. of water
a second at 118 or 119 in
the water - As a rule

The lake would be allowed
to fall, or would be
run down to 105 or less
before this matter was
settled -

The master of the
dam is desired to examine
or repair the main gate
and thinning, would
be as follows -

The main gate would
first be closed, maintaining
still water in the cutting
and tunnel, the front
gate would then be run
down, the main gate
lifted out of the way and
either run and repaired
or otherwise dealt with
as might be desirable -

The discharge will then
be reduced by means of the
sluicing plates in the
front gate to 500 c.f.p.
or whatever minimum is
required - With the lower
gates in the next closed
500 c.f.p. will pass with

a level (approximate) 2

106 in the shaft and
114 in the side ~~tank~~,²⁰
that the gas level in the
lower scuttles will be about
six feet; being capable of
lifting them against their
pressure will be provided.

These gates being lifted the
water will pass through the
curbs, and will probably
stand at rather below
100. in the side tanks;
any repairs to the sills and
framing of the main gates
will then be executed.

When it is desired to
return to ordinary methods
of working the swinging
scuttles of the front
allowing the side tanks to empty
gate will be closed, and
the lower gates in the
side tanks run down.

The swinging scuttles will
then be opened and the
main gates closed, pro-
viding still water in
the side tanks, and
allowing the front gate

We expect -

It will be now start
the only period during which
water can be sent off
entirely is just during the
lowering of the front shutter,
second, during the raising
of the lower gate at the
conclusion of the work, and
third during the raising
of the front shutter - With
proper planning most of the
operations should take more
than ten minutes, and
between them as long a
period as may be desired
can be allowed for the main
tunnel to be filled up
again -

The main tunnel and
the cutting which mouth
will contain altogether
not less than 700,000
cubic feet, which is enough
to supply over 1000 ft. for
23 minutes, or considerably
more than the period
for which water can be
be sent off altogether -

It has been decided

Lower gates in the shaft shall be lifted direct from above, and to enable this to be done a notch must be cut at the end of the shaft to a sufficient depth to allow a pipe to be put in through which the rod or chain to lift the gates can pass -

The axis of these pipes should be at $15'2''$ ($7'8''$ + half the length of the main gate pipes) from the centre line of the tank, and be in the centre line of the anchors - Its lower end should be at 114.00 and the notch must be filled up with concrete round the pipe to 126.00; the pipe may be of any length not less than twelve feet -

I think this note contains all the information required, but if any further explanation is wanted, I shall be glad to give it -

T. M. P. R.

S
21.7.94

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and those forming
the five inch squares
through A B and C, it
is therefore essential
that the holes in all
these sets of plates should
coincide accurately.

D. Eight cast iron
standards of the shape and
dimensions shown in figs.
7 to 10, each consisting
of a plate three feet
high and one foot wide
~~length~~ with a flange six
inches wide at each end.

The plate and flanges
are drawn half an
inch thick but may be
as much as may be
necessary to ensure
sound casting, but
the dimensions given,
namely three feet

and six inches are to be inside measurements.

One flange of each plate to have two rows of four holes $1\frac{1}{2}$ " from each edge and three inches apart.

In the main plate, one inch from the inside of the flange which is not provided with holes, to be a row of four holes three inches apart as shown in fig: 7.

The plates are to be bolted together in pairs as shown in fig: 10, and the flanges which are provided with holes must if necessary be machined so as to make a true joint. The necessary bolts to be provided, eight for

each joint.

E. Eight wrought or cast iron bars eighteen inches long and two inches square, each bar having two holes at $1\frac{1}{2}$ " from each end, and four other holes at right angles to the first two, at intervals of three inches between them as shown in fig: 11.

212.

Sixteen bolts six inches ~~and eight nine~~ and eight ~~eighteen and a half~~ inches from inside of head to inside of nut when screwed up, to be provided with these bars.

F. Eight plates of wrought iron $\frac{1}{4}$ " thick five feet long and one foot broad as shown

in fig: 13; each plate
to have a row of holes
three inches from one
edge, the end holes
being three inches from
the two ends of the
plate and the others
at intervals of six inches
along its whole length.

G. Six cast iron plates
of the shape and
dimensions shewn in
figs: 14 to 17, each plate
to be four feet long
two feet seven and
a half inches wide,
and one inch thick,
with a flange or rim
on each side three
inches high at the
ends and six inches at
the centre of the plate;

P. 2029
the flange or rim to be
one inch thick except
for a distance of two
inches on each side
of the centre where it is
to be increased to
three inches. The centre
portion to be pierced
with a hole two inches
in diameter with its
centre two inches
above the upper sur-
face of the plate.
Each plate to be
provided with four
holes for $\frac{5}{8}$ " bolts in
the position shewn in
fig: 14 namely six
inches from each
side of the plate and
three inches and six

inches from its lower edge. Bolts $1\frac{1}{2}$ " long from inside of head to inside of nut to be provided for each of these holes.

H. Seven steel blocks of the shape and dimensions shown in fig: 18. each block to be six inches long four inches by four inches with a turned stud one inch in diameter projecting one and a half inch from each of the square ends, and a hole two inches in diameter bored from side to side in the

centre of the block at right angles to the line of the studs.

I. Seven steel pins two inches diameter and nine inches long exclusive of head one inch deep and two and a half inches in diameter, screwed for a length of three inches at the end, and provided with a nut one and a half inch deep. The pins to pass easily into the holes in the blocks H and the flanges of the plates G.

If the flange be made
by bending the plate
itself the joint will be
as shown at the bottom
of figs 3 & 4, the outer
covering plate being
bent over the flange
and extending the full
width of the latter, and
the inner one being
similarly bent but
cut off $1\frac{1}{2}$ " from the
edge of the flange.

All joints made up
before despatch to be
made with rivets, those
to be made up at —
destination to be made
with bolts as the position
is one in which rivetting
cannot be done —
conveniently.

It is essential

that the two plates should be exactly similar and when placed back to back neither the edges of the plates nor the positions of the holes in them must differ by more than a quarter of an inch.

If made in more than one piece they must be put together before despatch, and the different parts marked for erection at destination.

All bolts required by the plans to be provided; there will be one hundred and twenty in number for each of the plates A or two hundred and forty in all with an allowance

of ten per cent for losses. This is in addition to whatever bolts may be necessary for joints or for fixing the angle irons to the sides of the plate. Each bolt to be $1\frac{1}{2}$ " long from inside of head to inside of nut when screwed up and to be provided with a square nut and two circular washers $1\frac{1}{4}$ " in diameter.

B. Fifty wrought iron plates (fig: 5) each eighteen inches square and one quarter of an inch thick with eight holes similar to those of plate A forming two squares whose sides are fifteen inches

and five inches
respectively, and parallel
to the sides of the plates.

C. Fifty similar plates
(fig: 6) each twelve
inches square and one
quarter of an inch thick
with four holes in each,
forming a square of
five inches with sides
parallel to those of the
plate.

The plates B are
intended to be bolted
to the front of the plates
A, and plates C to the
front of plates B, the
bolts forming the
fifteen inch squares
passing through A and B

Specification of iron
work required for the
Periyar Project.

A. Two plates of galvanized
wrought iron or mild
steel each ten feet by
six feet, and one quarter
of an inch thick, —
flanged to a depth of
two and a half inches
on the longer side,
and pierced with
fifteen groups of eight
holes for $\frac{5}{8}$ " bolts as
shown in Figs. 1 and 2.

The eight holes of
each group to form
two squares whose sides
are fifteen inches
and five inches respec-
tively, the sides of the

of the squares being
an parallel with the edges
res of the plate and the
to centres of the groups to
form three rows of
five, the three rows
C. being respectively one
foot, three feet, and
five feet, from the
top edge of the plate,
and the five centres
for forming each row
respectively one foot,
three feet, five feet,
seven feet, and nine
feet, from either side.

The flanges on the
edges of the plate may
be made either by
bending the plate itself
as shown on the bottom
of fig: 2 or by pinning

or bolting on an angle
iron $3 \times 3 \times \frac{1}{4}$ as shown
on the top of the same
figure, as may be most
convenient; it is important
that the angle of the
flange with the plate
should be as sharp as
possible.

For the purpose of
packing and transport
it will probably be con-
venient to make these
plates in more pieces
than one, and if so the
divisions must be vertical,
and the most convenient
position for them will
be on one or more of
the lines $x x$ in fig: 1.
which divide the lengths
into five equal parts.

The joint to be made
by inside and outside
covering strips of $\frac{1}{8}$ "
thick and six inches wide
with a row of bolts 3"
apart on each side of
the joint. If the top
and bottom flanges
are made with angle
irons the latter with of
course be in one piece
for the whole length
of the plate, and in
that case the joint
will be made as shown
in the upper part of
figs 3 and 4, the inter
covering plate being
cut off at the bottom
of the angle iron and
the inner one extending
the full height of the
main plate.