

WCA:KET

EXPLANATION OF DRAWINGS USED IN
MANUFACTURE OF PITCH TESTING DEVICE.

Letter Circular LC17
(Communication B514)
Gage Section
Bureau of Standards
Washington, D. C.
February 10, 1919
4 Sheets

Drawing Reference:

Two types of Pitch Testing Devices have been developed by the Gage Section of the Bureau of Standards, namely, type "A" and type "B". Type "A" is designed to measure the lead of plain, or cylindrical, thread gages and Type "B" is designed to test the lead of thread gages cut on the Briggs Standard taper of 3/4" per foot, measured on the diameter. The details and assemblies of Type "A" are shown on Blue Prints D1053, D1054, D1055, D1056, D1057, D1058 and D1059. The Details and Assembly of Type "B" are shown on Blue Prints D1053, D1070, D1055, D1056, D1057 and D1074. The Table which is to be used with either type is detailed on Blue Print D1068. These machines are designed to measure directly the lead of both male and female gages. The construction of the face plates and stylus holder used with female gages is included in these drawings.

Detail Order List:

The following list shows firms from which the Bureau of Standards orders parts for the lead tester:

- Micrometer. Supplied by Mt. Wilson Solar Observatory and there listed as Job No. 236.
- Lens. 32 mm. Microscope Objective. Supplied by Bausch & Lomb Optical Co., Rochester, N.Y.; the Spencer Lens Co., Buffalo, N.Y.; and others.
- Lamp. 6 Volt, Straight Filament, Galvanometer Lamp. Supplied by Leeds & Northrup Co., Philadelphia, Pa.
- Prisms. 1 1/4" Aperature Right Prisms. Supplied by Optical Companies named above.
- Rack and Pinion. Rack 3" long x 10 mm. wide. Pinion 14.5 mm. outside diameter. Supplied by the Bausch & Lomb Optical Co.

CONSTRUCTION OF THE APPARATUS.

The Pitch Testing Device consists principally of three parts,- (1) the Base and Centers which support the gage while it is being tested; (2) the Rail which runs on ball races provided in the Base and which carries a micrometer to measure its movement; the Rail



supports also, (3) the Indicating device. The only difference between Type "A" and Type "B" lies in the construction of the Base. In the former the centers are mounted parallel to the direction of motion of the carriage, while in the latter they are mounted at an angle corresponding to the taper of the gage.

The Base and Centers:

The Base details are shown on Blue Prints D1054 (Type "A") and D1070 (Type "B"). The centers and clamps used with both bases are detailed on Blue Print D1057. The casting consists mainly of one long horizontal main bar with two vertical columns and one horizontal projecting arm. Care must be exercised in the machining of the ball races, which are situated at the base of each vertical column and extend along that part of the main bar that projects beyond the two vertical columns, and also along the extreme end of the horizontal projecting arm. These races must be free from all faults, brought to fairly high polish, and in the Type "A" apparatus, must be parallel to the 90° "V's" which are cut in the top of each column to support the centers. In the Type "B" apparatus, the ball races and the "V's" in the top of the columns should be at an angle of 1° 47' and some few seconds, which corresponds to the slope of 3/8" per foot which is given to the threads of a Briggs Standard Pipe Thread with regard to the center line of the gage. As furnished, the casting is not large enough at the top of the left hand column and the pad D1070-3 is designed to make up this deficiency. The pad should be fastened to the front of the column before the top of the column is finished in order that the finished base may appear more like a single piece.

The Rail:

The Rail, detailed on Blue Print D1055, consists of one long bar with a horizontal arm projecting approximately from the center. The angle cut into the bottom of the rail completes the four point ball race, of which the angle in the base, situated at the bottom of the columns, forms the lower half. The horizontal faces take the load of the rail and the vertical faces act as guides. The rear ball race is completed by a single surface to assume part of the load but is left free of all guiding influences. This is in accordance with the best design for the support of moving carriages where stability and accuracy of motion are prime requirements. The surfaces of the ball races in the rail must receive the same careful treatment as those in the base. In either case where even slight imperfections appear in the race, hardened steel inserts should be ground after being put into the place of the defective surfaces.

The double angle which runs along the top of the rail should be accurately machined parallel to the ball races in the bottom of the rail. The Micrometer Holder 1055-15 is held in place by this double angle and it is absolutely necessary for the axis of the micrometer screw to lie parallel at all times to the line of motion of the rail. This should also be taken into consideration when the Micrometer Holder 1055-15 is being machined. In the construction

of this rail at the Bureau of Standards this double angle at the top of the rail is scraped flat to a nice sliding fit through the proper groove in the Saddle D1055-2. This may be an unnecessary refinement.

The Micrometer Holder carries the Micrometer Nut clamped tight in its central section, through which the Micrometer screw turns carrying a graduated dial. At the outside end of the Holder is carried an indicator which slides past a fixed scale showing the number of turns made by the screw. There is an index mark at the end of this scale to which the graduations of the disk are referred. The scale is carried on a stand fastened to the extreme right of the base and clearly shown in the assembly drawings D1058 (Type "A") and D1074 (Type "B"). The Micrometer Screw carries a dust cap at each end so adjusted that no dust can reach the screw at any position of its entire travel of about 1.2 inches.

The Saddle D1055-2 connects the Rail and the slide D1056-1 which carries all the moving parts of the indicating mechanism. The Saddle also carries in a long oval hole a piece of ground glass upon which the indicating beam of light is cast, as shown on the assembly D1058. The dove tail slot that carries the slide should be machined smoothly and accurately as to size. The motion of the slide is controlled by a rack and pinion. This is a convenient but unnecessary refinement. When the rack and pinion are desired, they should be as specified in the Detail Order List.

Indicating Device:

The Indicating Mechanism may be considered in two parts, the Mechanical Lever and the Optical Lever. The Mechanical Lever is a simple rod carrying a stylus at one end and a lens at the other. The rod is supported and held in position by a flat spring D1056-4 and a Pivot Rod D1056-15. The flat spring is clamped at its lower end to the block D1056-2 which holds the spring steady with reference to the slide D1056-1. The angular motion of the rod is limited by the Guide D1056-7.

The source of light of the Optical Lever is furnished by the straight filament Lamp specified in the Detail Order List. The moving part is the Lens at the end of the Mechanical Lever. The image is cast upon the ground glass carried in the front of the Saddle. To bend the light ray as desired, two plain glass prisms or mirrors are used. The multiplication of motion from the stylus point through the Mechanical and Optical Levers to the image on the ground glass is about two hundred. With this ratio a motion of the rail (which is equal and opposite to the apparent motion of the stylus) of one one hundred thousandth of an inch can be measured.

There are several points of especial interest to be noted in connection with the Indicating Mechanism. The image of the Lamp filament is too broad to be used in accurate measurement. To overcome this, the bottom of the Lamp Globe is silvered and fine lines

are ruled in the silvering parallel to the straight filament. This gives a much narrower source of light and a much sharper image. The apparatus has been found to be so sensitive that motions indicated by a fractional part of the width of the image may be detected. Two fine black lines are ruled to form a large X upon the ground glass screen and one edge of the light ray is always brought up from the same direction to cross the ruled lines at their intersection. In this way the apparatus may be made to repeat its reading to less than one one hundred thousandth of an inch.

When the indicating mechanism is at rest with no gage between the centers, the center of the lens and the center line of the light ray are about a quarter of an inch apart. This is shown in the side elevation on D1058. When the apparatus is to be used, the stylus should be brought to bear upon the thread gage so that the center lines of the lens and light ray are in coincidence. This is accomplished by moving the slide forward about a quarter of an inch after the stylus has been brought just to bear against the threads.

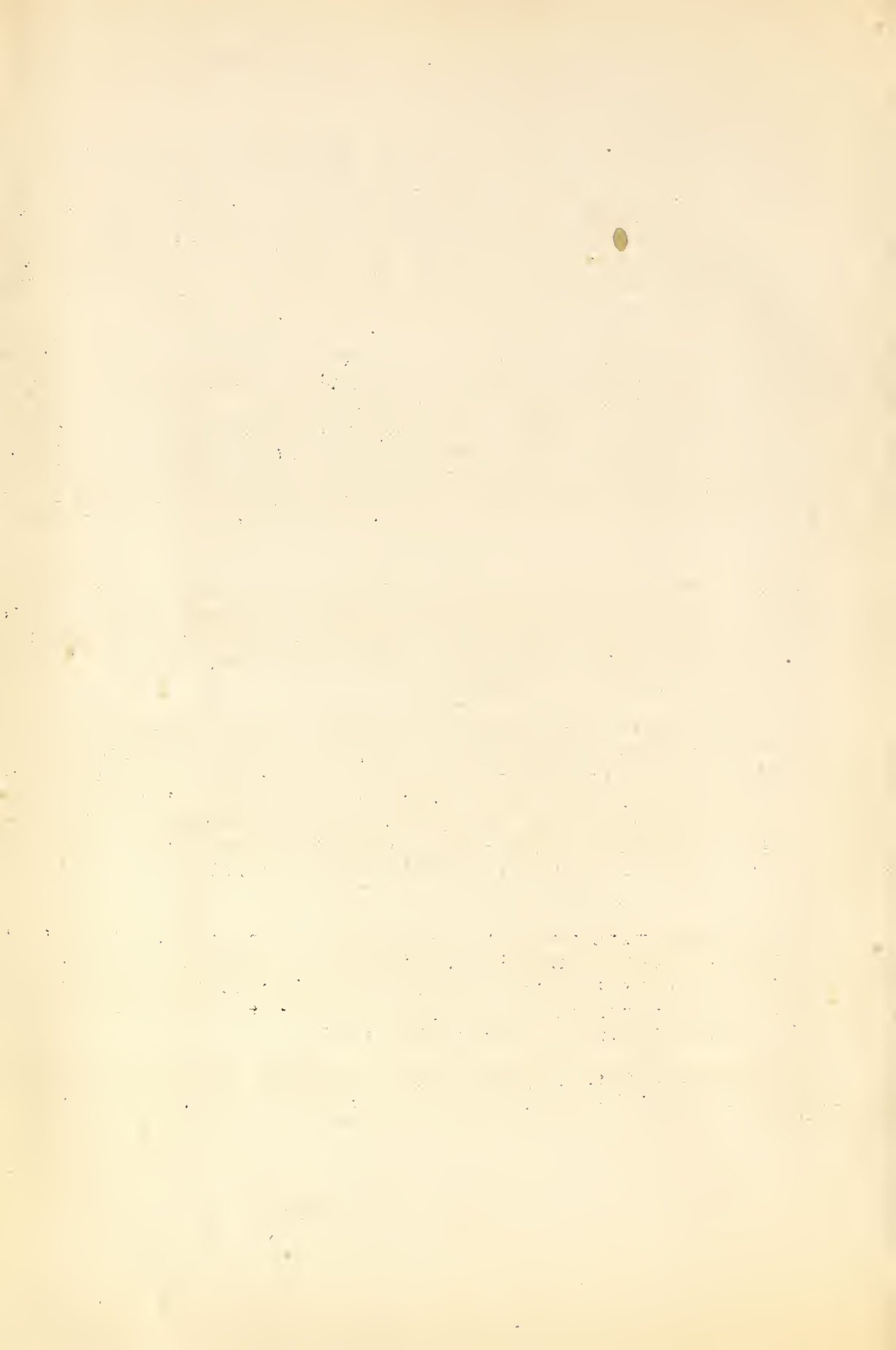
The reflecting surface of the prisms may be left unsilvered and backed simply by some thin white paper; cigarette paper answers the purpose very well. It is not imperative that the prism surfaces be optically flat though this will aid materially in the successful operation of the instrument.

The top of the flat spring should be given a permanent set at a small angle to the bottom of the spring so that when the indicating mechanism is at rest the rod supporting the lens will have a decided tendency to lie at an angle to the center line of the slide. This has been found desirable, after numerous trials; for when the rod is brought into line with this center line, the spring is under load and is therefore more stable and reliable in its reading.

The pressure with which the micrometer face bears against the anvil should be kept as nearly constant as possible. This is effected by the use of the weight shown attached to the rail by a fine cord which passes over a pulley in order to change the vertical pull of gravity into a horizontal pull.

Any further points regarding the construction of this apparatus or its use will be furnished, upon request, by the Bureau of Standards.

BUREAU OF STANDARDS.



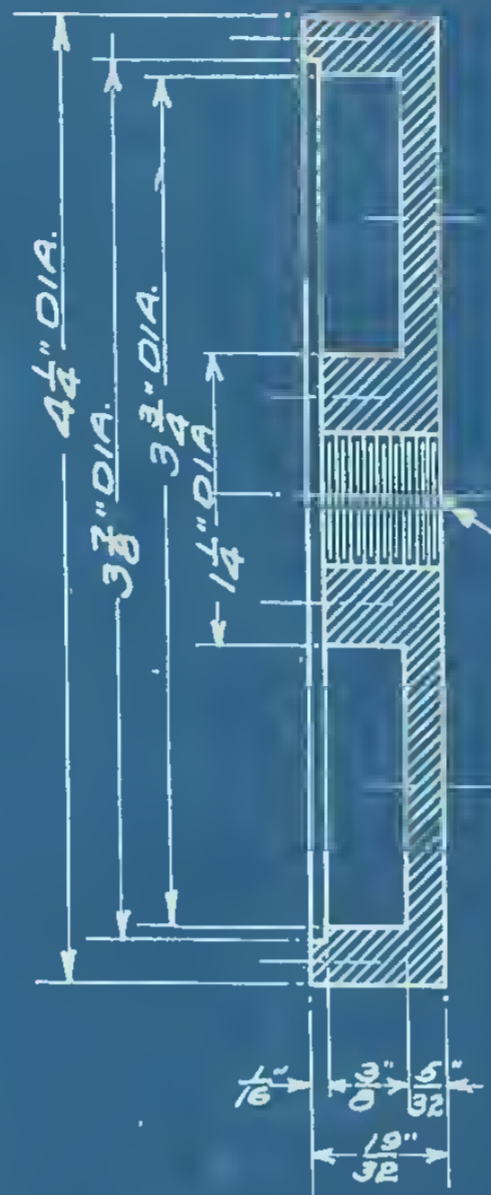
#6-40 TAP
A.S.M.E. STD.
 $\frac{3}{16}$ " DEEP
4 HOLES ON $4\frac{1}{16}$ " DIA.
4 HOLES ON $\frac{15}{16}$ " DIA.

#19 (0.166") DRILL
THRU
C-SINK FOR #8-36
FLAT HD. MACH. SCR.
8 HOLES EQUALLY
SPACED.

$\frac{1}{8}$ " x $\frac{1}{8}$ " SLOT
TO BE MILLED
WITH #2 IN
POSITION

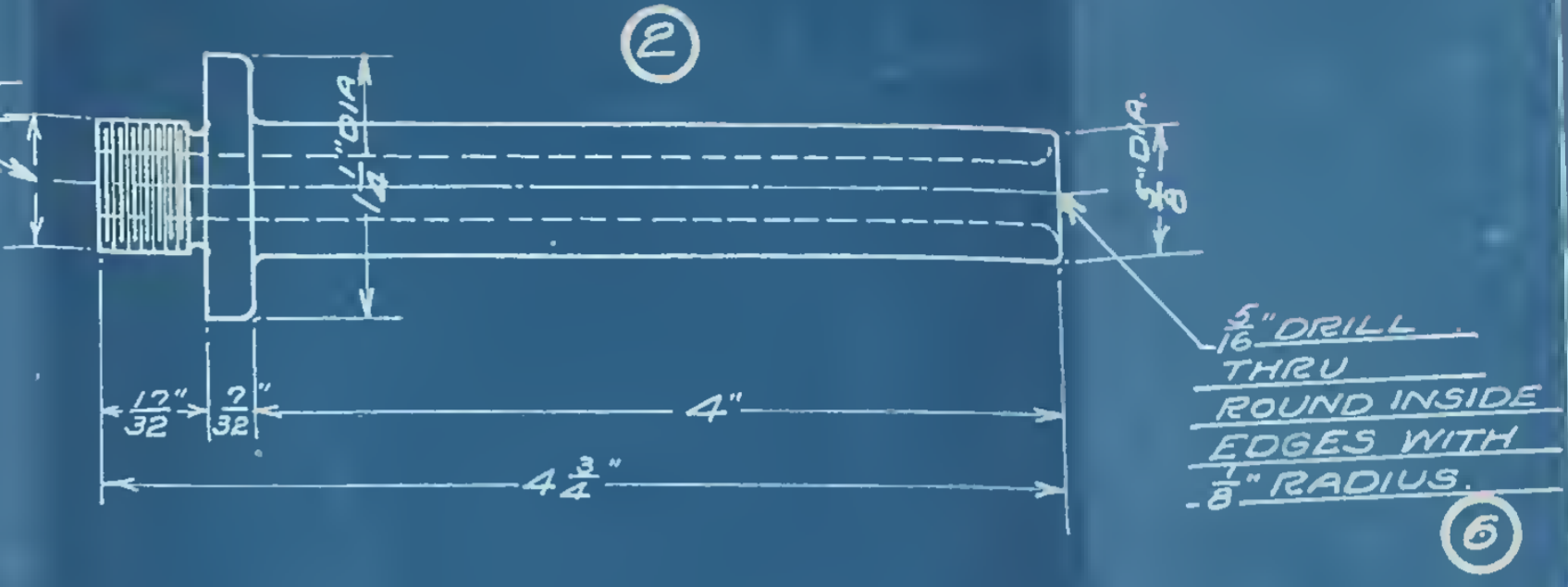


"f" ALL OVER

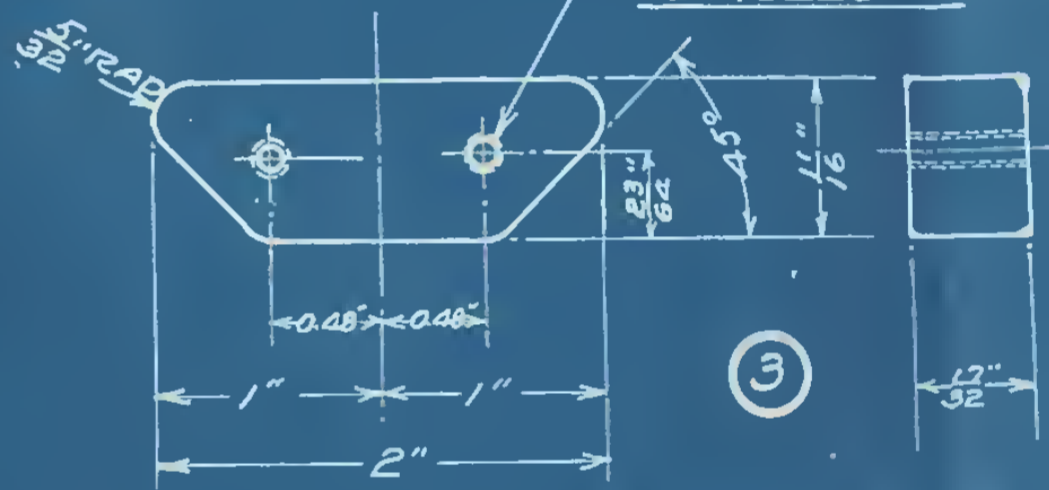


$\frac{5}{8}$ " x 18 THREAD
SAE. STD.

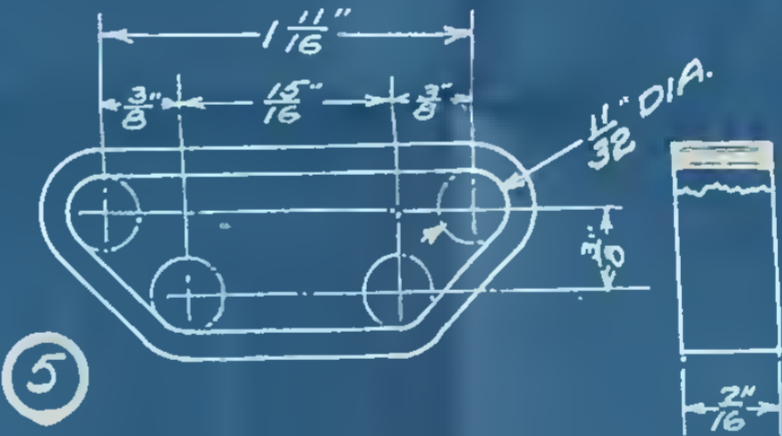
$\frac{5}{8}$ " x 18 TAP
SAE. STD
THRU.



#8-36 TAP
ASME STD.
THRU
2 HOLES



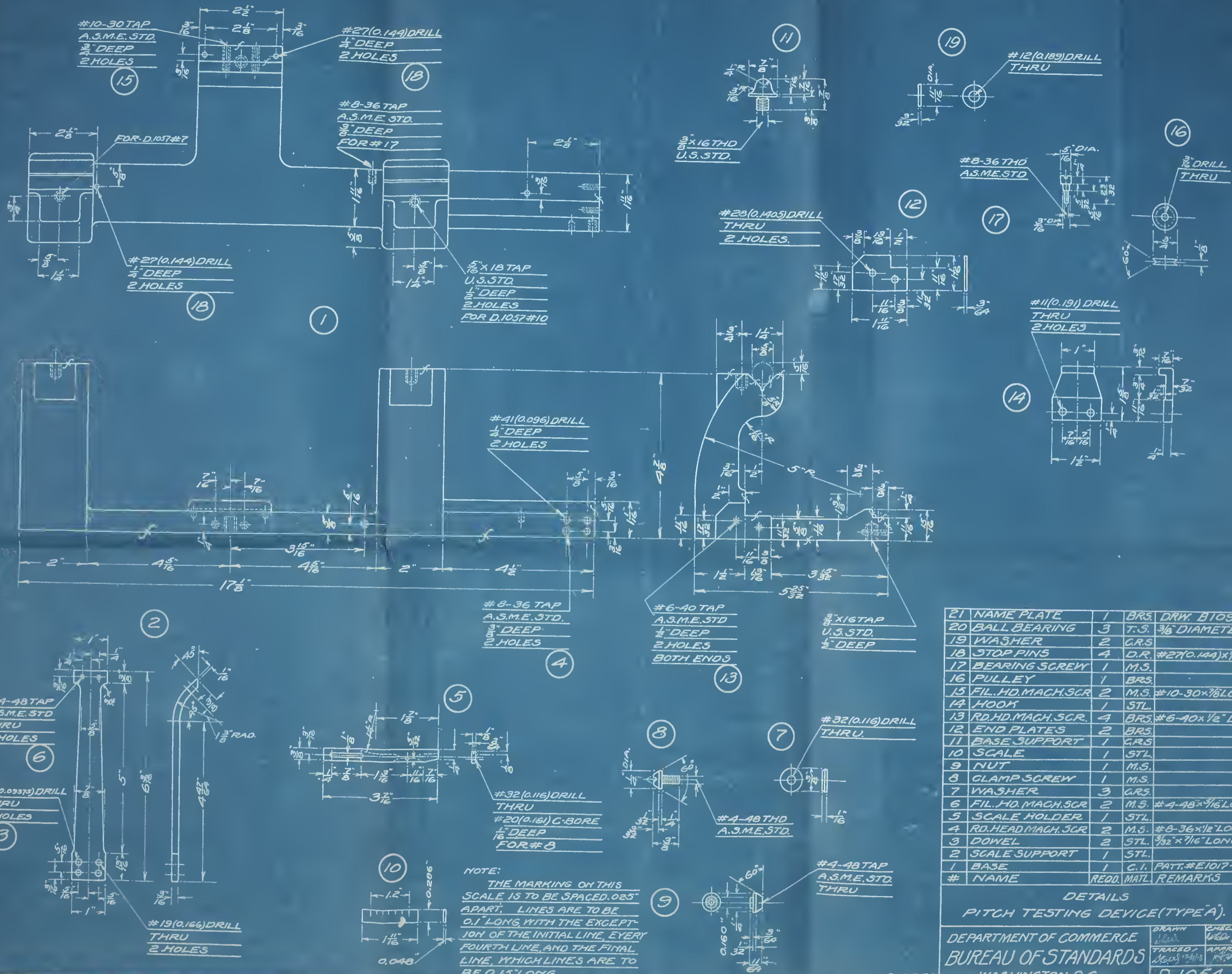
#27 (0.144") DRILL
THRU
C-SINK FOR #8
4 HOLES ON $4\frac{1}{16}$ " DIA.
4 HOLES ON $\frac{15}{16}$ " DIA.



COIL TO CONTAIN 500 TURNS
OF #34 (0.0063") B&S GAGE
ENAMELED COVERED COPPER
WIRE. (TEN ROWS OF 50 TURNS.)
EACH COIL TO BE WRAPPED
WITH LINEN INSULATING TAPE
AND SHELLACKED
FOUR COILS TO BE CONN-
ECTED IN SERIES AND THE TER-
MINAL CONNECTIONS TO BE
BROUGHT OUT THRU STEM (#2)
BY FLEXIBLE LEADS (#6)

#	NAME	REQD	MATL.	REMARKS
10	FLAT HD. MACH. SCR			
9				
8	FLAT HD. MACH. SCR	8	M.S.	#6-40 x $\frac{1}{2}$ " LONG
7	FACE PLATE	1	M.S.	
6	FLEX. LEAD WIRE	4	COP.	
5	COIL	4	COP.	840 FT. TOTAL L.
4	FLAT HD. MACH. SCR.	8	M.S.	#8-36 x $\frac{1}{16}$ " LONG
3	CORE	4	C.R.S.	
2	STEM	1	T.S.	
1	FLANGE	1	C.I.	

MAGNETIC FACE PLATE
PITCH TESTING DEVICE TYPE "A"
DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
WASHINGTON, D.C.
D 1053



21	NAME PLATE	1	BRS.	DRW. B1092
20	BALL BEARING	3	T.S.	3/8" DIAMETER
19	WASHER	2	GRS.	
18	STOP PINS	4	D.R.	#27(0.144)X1/2" LONG
17	BEARING SCREW	1	M.S.	
16	PULLEY	1	BRS.	
15	FIL. HD. MACH. SCR.	2	M.S.	#10-30X7/8" LONG
14	HOOK	1	STL.	
13	RD. HD. MACH. SCR.	4	BRS.	#6-40X1/2" LONG
12	END PLATES	2	BRS.	
11	BASE SUPPORT	1	GRS.	
10	SCALE	1	STL.	
9	NUT	1	M.S.	
8	CLAMP SCREW	1	M.S.	
7	WASHER	3	GRS.	
6	FIL. HD. MACH. SCR.	2	M.S.	#4-48X7/16" LONG
5	SCALE HOLDER	1	STL.	
4	RD. HEAD MACH. SCR.	2	M.S.	#8-36X1/2" LONG
3	DOWEL	2	STL.	3/32" X 7/16" LONG
2	SCALE SUPPORT	1	STL.	
1	BASE	1	C.I.	PATT. #E1017-3
#	NAME		REQD. MATL.	REMARKS

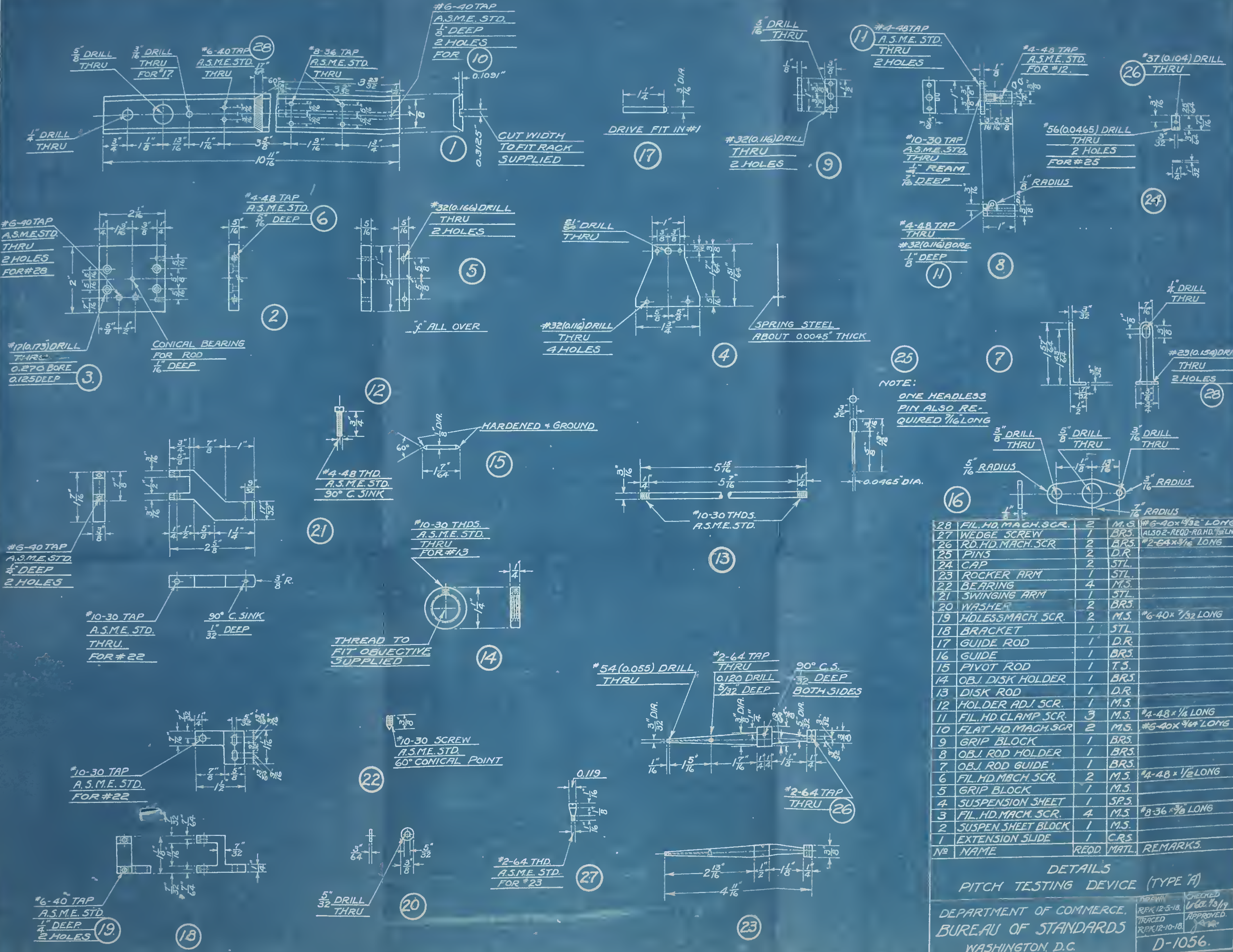
DETAILS
PITCH TESTING DEVICE (TYPE A)

DEPARTMENT OF COMMERCE		DRAWN	CHECKED
BUREAU OF STANDARDS		TRACED	APPROVED
WASHINGTON, D.C.		D.1054	

G.D.331

NOTE:
THE MARKINGS ON THIS SCALE IS TO BE SPACED .025" APART. LINES ARE TO BE 0.1" LONG, WITH THE EXCEPTION OF THE INITIAL LINE, EVERY FOURTH LINE, AND THE FINAL LINE, WHICH LINES ARE TO BE 0.15" LONG.





NOTE:
ONE HEADLESS
PIN ALSO RE-
QUIRED 7/16" LONG

No	NAME	REQD	MATL.	REMARKS
28	FIL. HD. MACH. SCR.	2	M.S.	#6-40 x 1 1/2" LONG
27	WEDGE SCREW	1	BRS.	ALSO 2-REQD. RD. HD. 1/2" LONG
26	RD. HD. MACH. SCR.	2	BRS.	#2-64 x 3/16" LONG
25	PINS	2	D.R.	
24	CAP	2	STL.	
23	ROCKER ARM	1	STL.	
22	BEARING	4	M.S.	
21	SWINGING ARM	1	STL.	
20	WASHER	2	BRS.	
19	HDLESS MACH. SCR.	2	M.S.	#6-40 x 7/32" LONG
18	BRACKET	1	STL.	
17	GUIDE ROD	1	D.R.	
16	GUIDE	1	BRS.	
15	PIVOT ROD	1	T.S.	
14	OBJ. DISK HOLDER	1	BRS.	
13	DISK ROD	1	D.R.	
12	HOLDER ADJ. SCR.	1	M.S.	
11	FIL. HD. CLAMP SCR.	3	M.S.	#4-48 x 1/4" LONG
10	FLAT HD. MACH. SCR.	2	M.S.	#6-40 x 3/64" LONG
9	GRIP BLOCK	1	BRS.	
8	OBJ. ROD HOLDER	1	BRS.	
7	OBJ. ROD GUIDE	1	BRS.	
6	FIL. HD. MACH. SCR.	2	M.S.	#4-48 x 1/2" LONG
5	GRIP BLOCK	1	M.S.	
4	SUSPENSION SHEET	1	S.P.S.	
3	FIL. HD. MACH. SCR.	4	M.S.	#8-36 x 3/8" LONG
2	SUSP. SHEET BLOCK	1	M.S.	
1	EXTENSION SLIDE	1	CRS.	

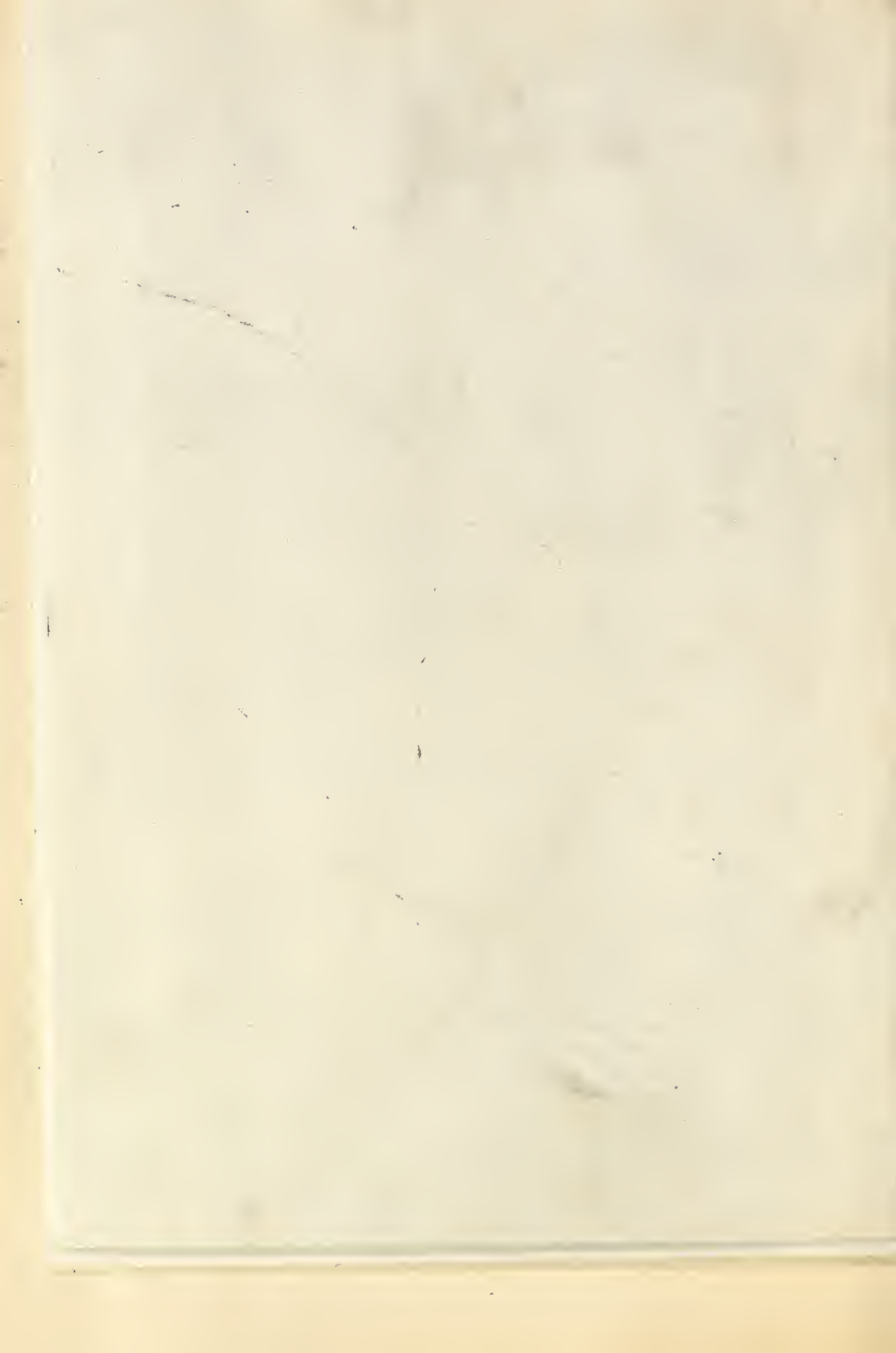
DETAILS
PITCH TESTING DEVICE (TYPE "A")

DEPARTMENT OF COMMERCE,
BUREAU OF STANDARDS
WASHINGTON, D.C.

REVISION
RFX 12-5-18
TRACED
RFX 12-10-18

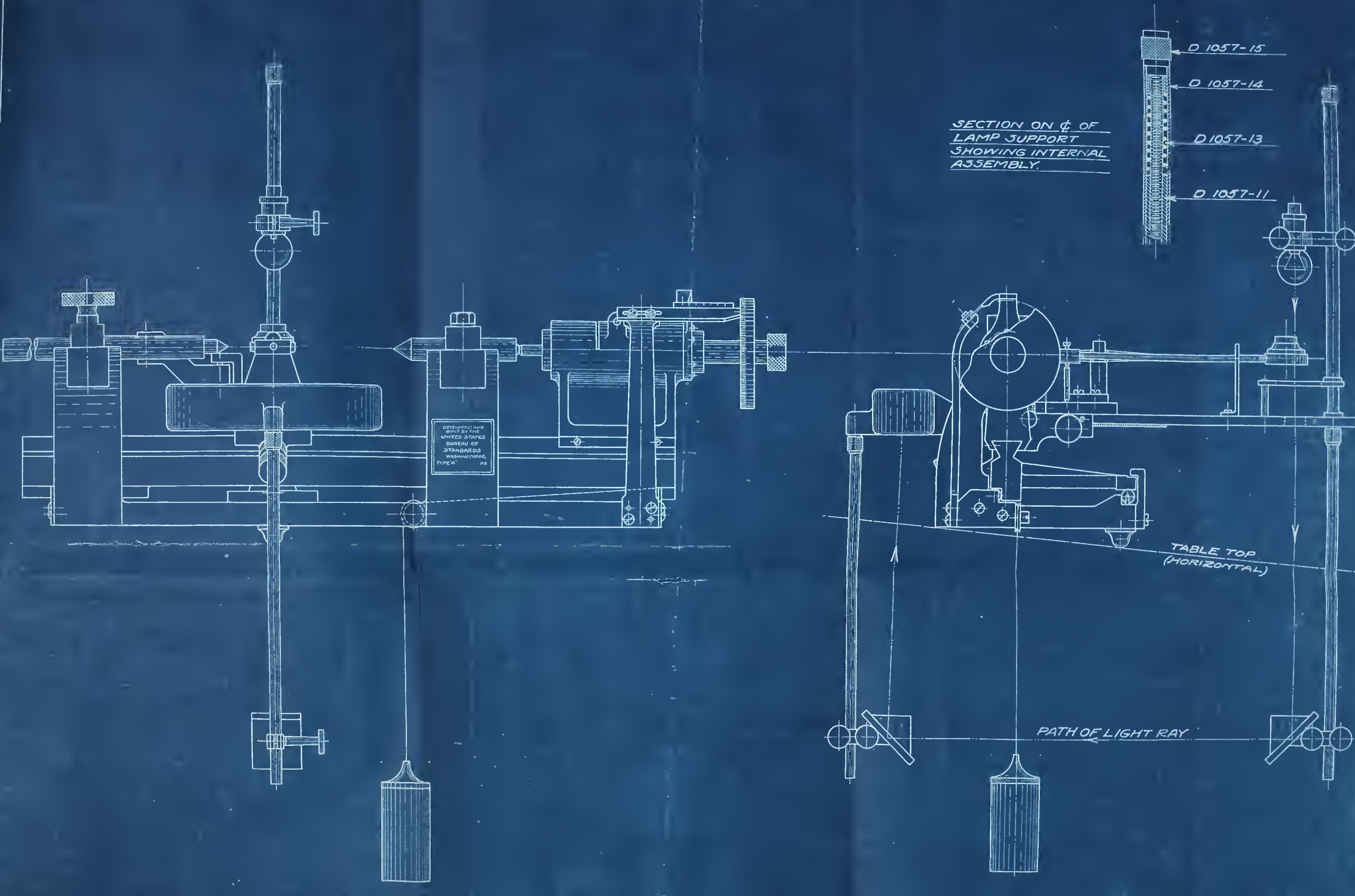
CHECKED
V.G. 12/19
APPROVED.

D-1056.

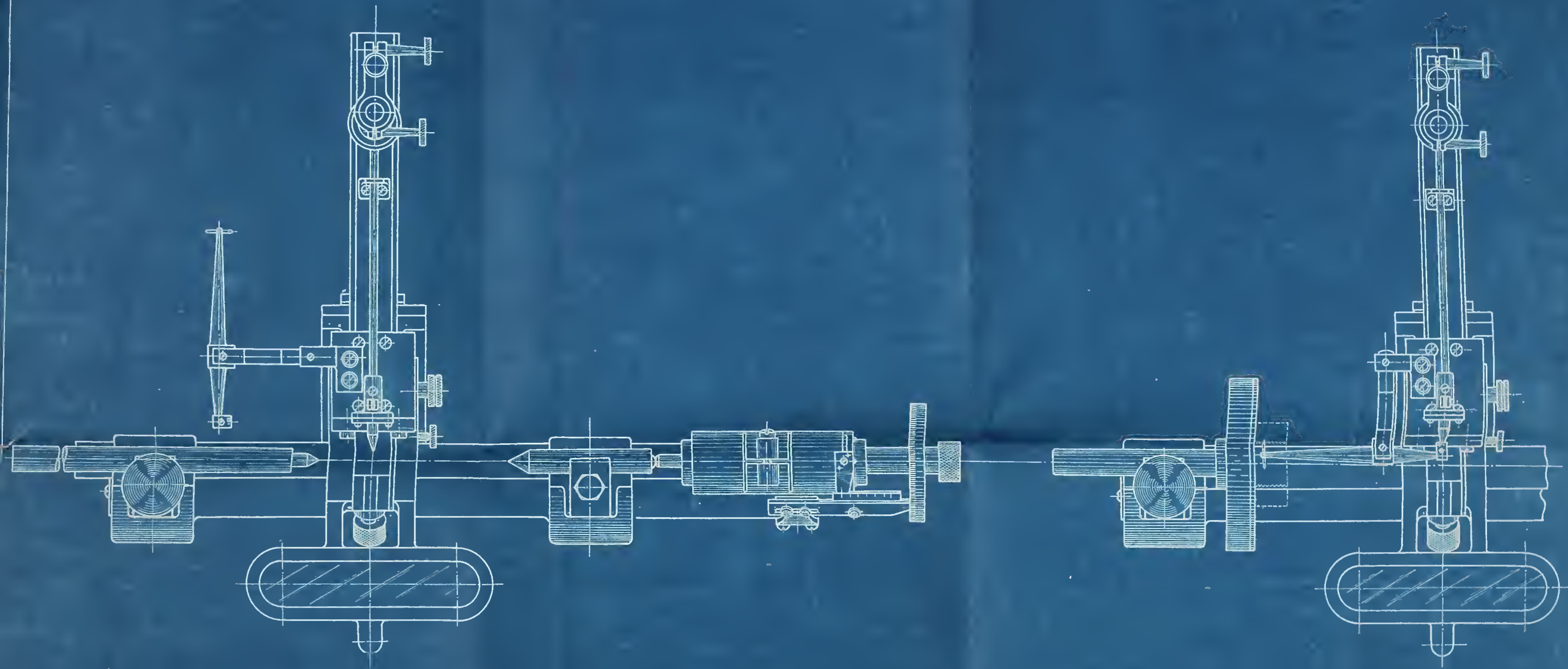




D1058

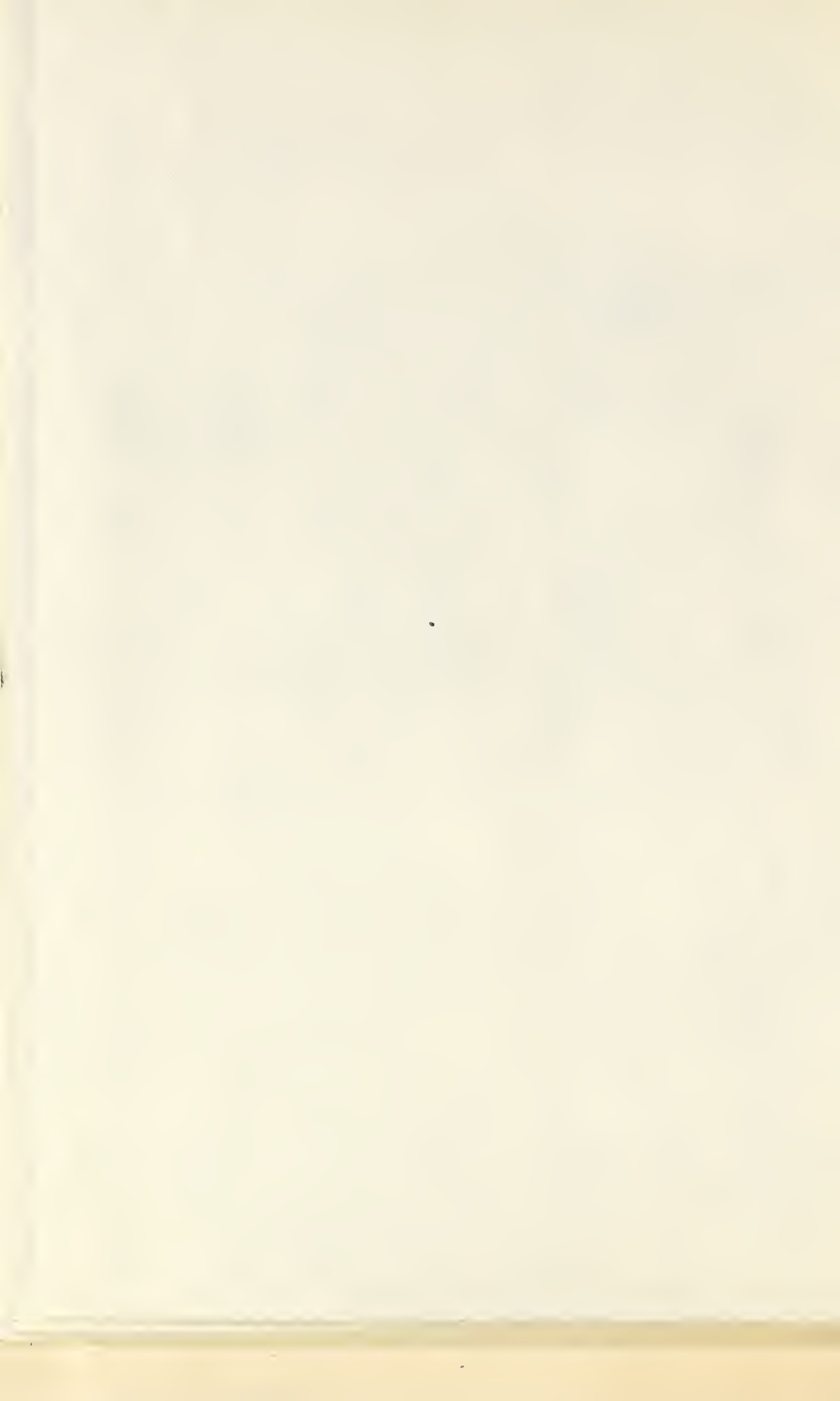


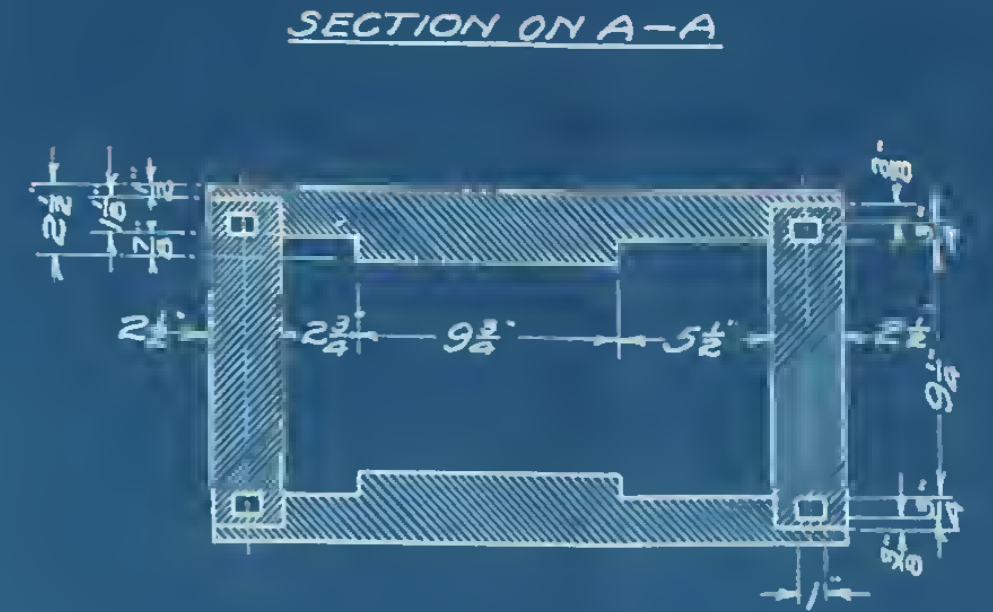
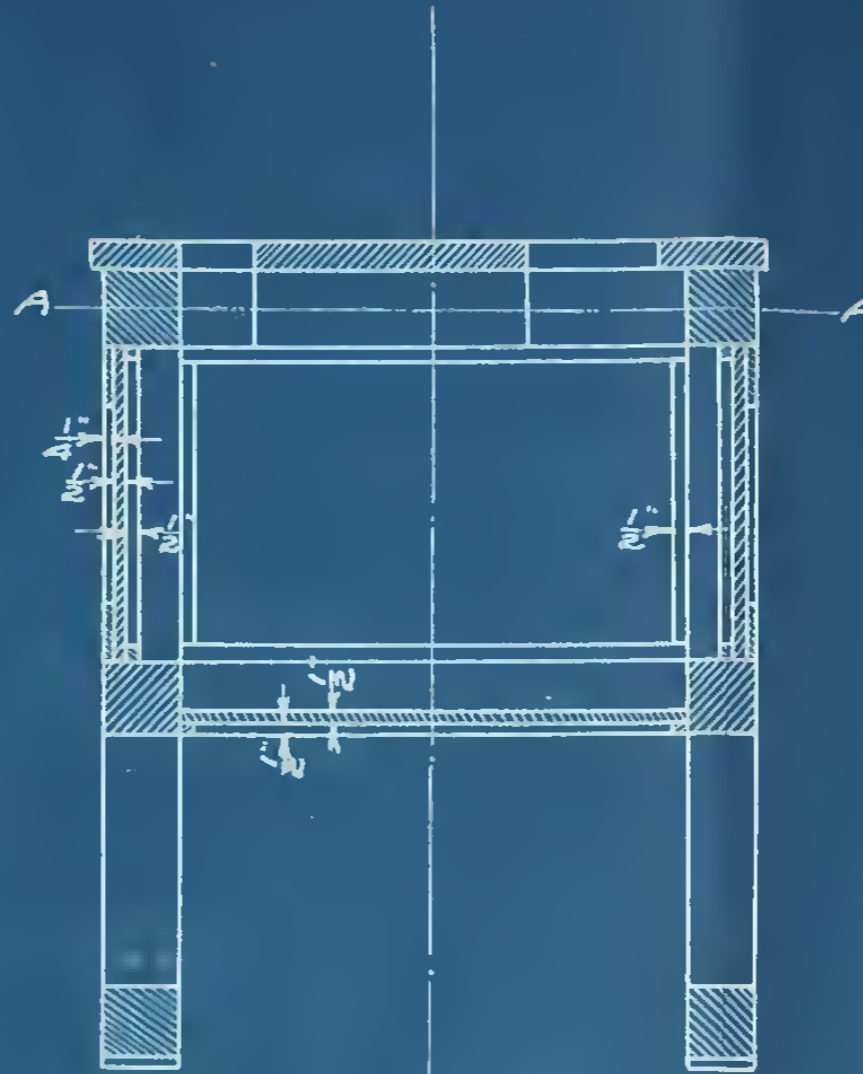
#	NAME	REQD.	MATL.	REMARKS
ASSEMBLY				
PITCH TESTING DEVICE (TYPE "A").				
DEPARTMENT OF COMMERCE		DRAWN	CHECKED	
BUREAU OF STANDARDS		J.E.W.	W.C.A. 12/19	
WASHINGTON, D.C.		TRACED	APPROVED	
		J.E.W. 12/19	W.C.A.	
G.D.331		D.1058		



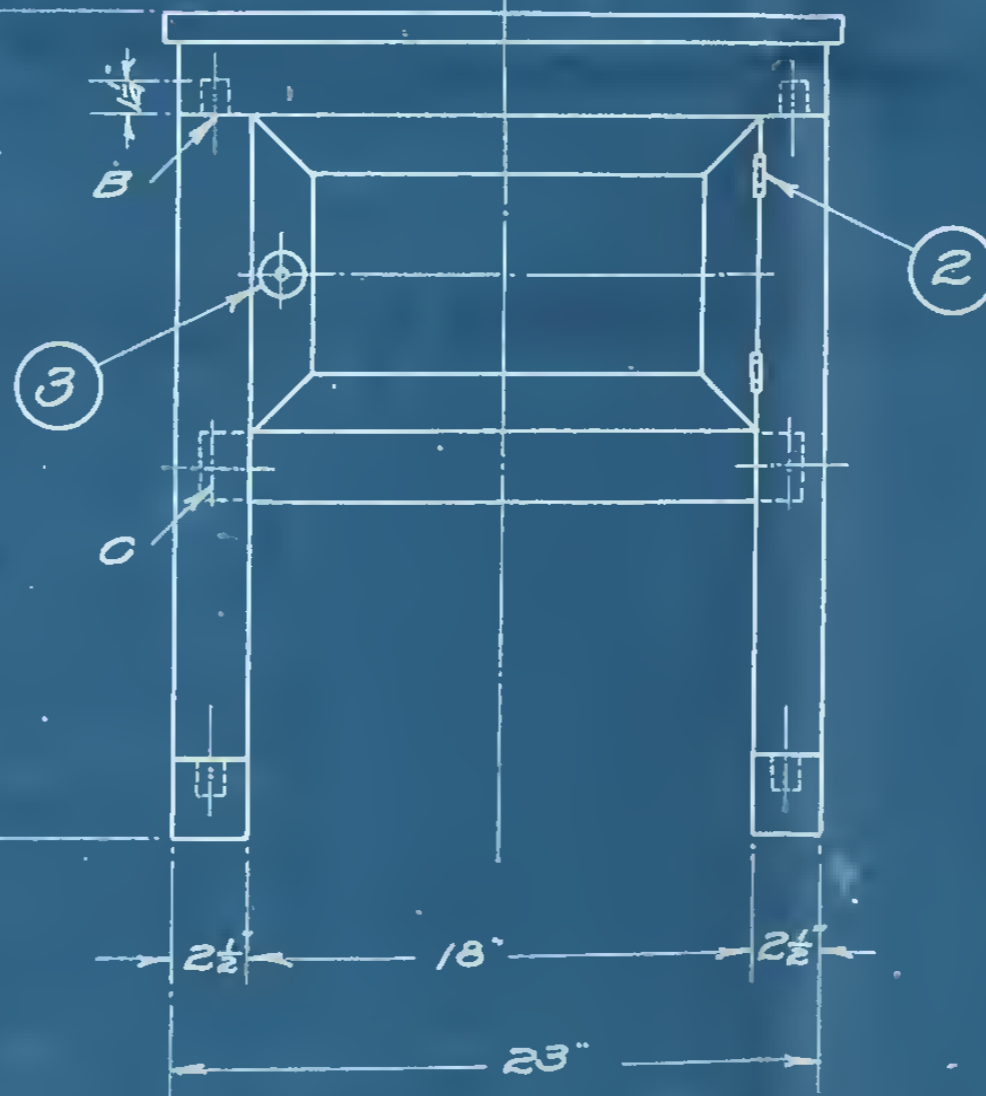
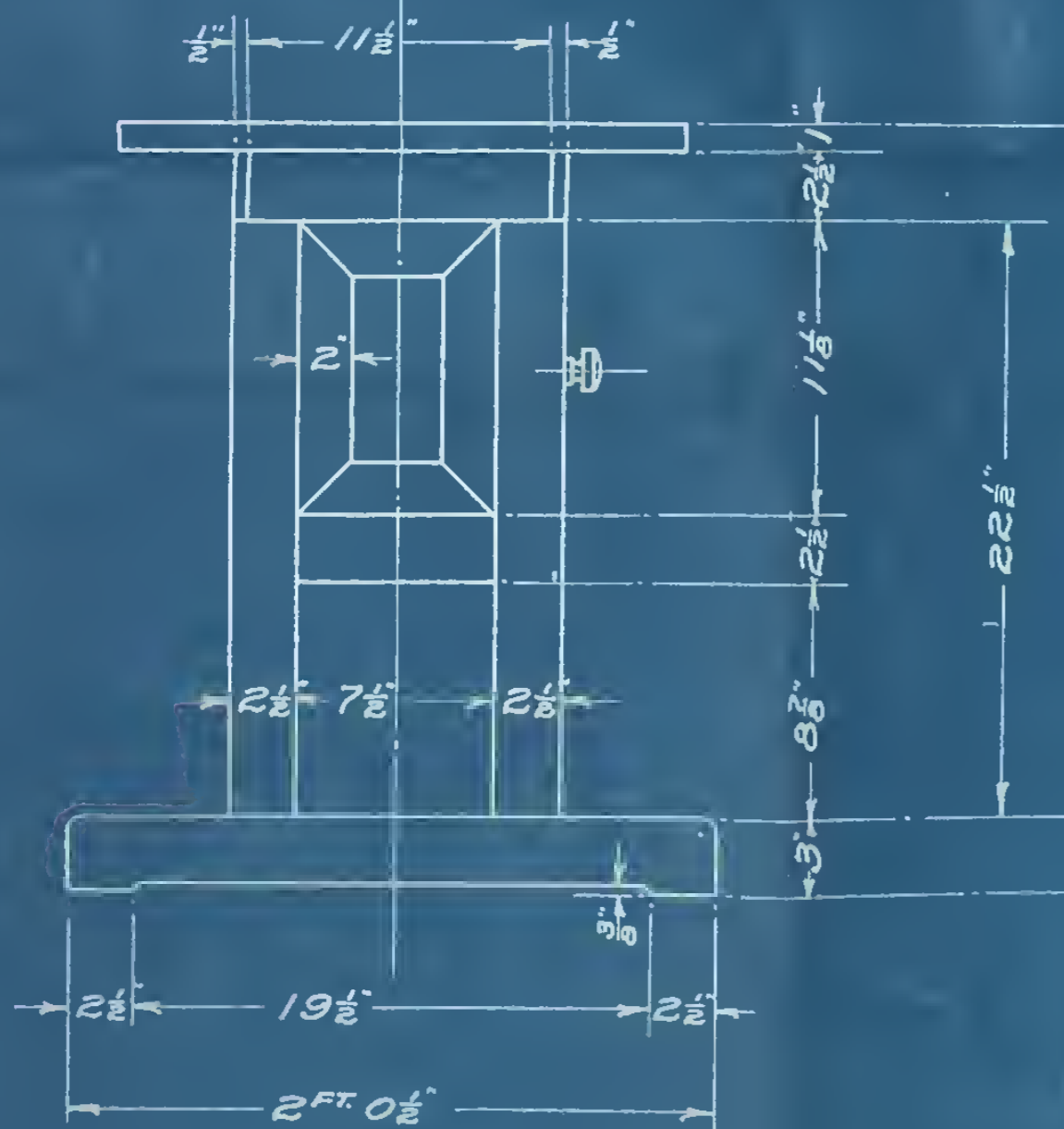
#	NAME	REQD.	MATL.	REMARKS
ASSEMBLY PLAN VIEW PITCH TESTING DEVICE (TYPE 'A').				
DEPARTMENT OF COMMERCE		DRAWN	CHECKED	
BUREAU OF STANDARDS		TRACED	APPROV.	
WASHINGTON, D.C.		D. W. 1/20/19	J. B. 1/20/19	
				D. 1059

G.D.331





1



JOINT AT "B"



JOINT AT "C"



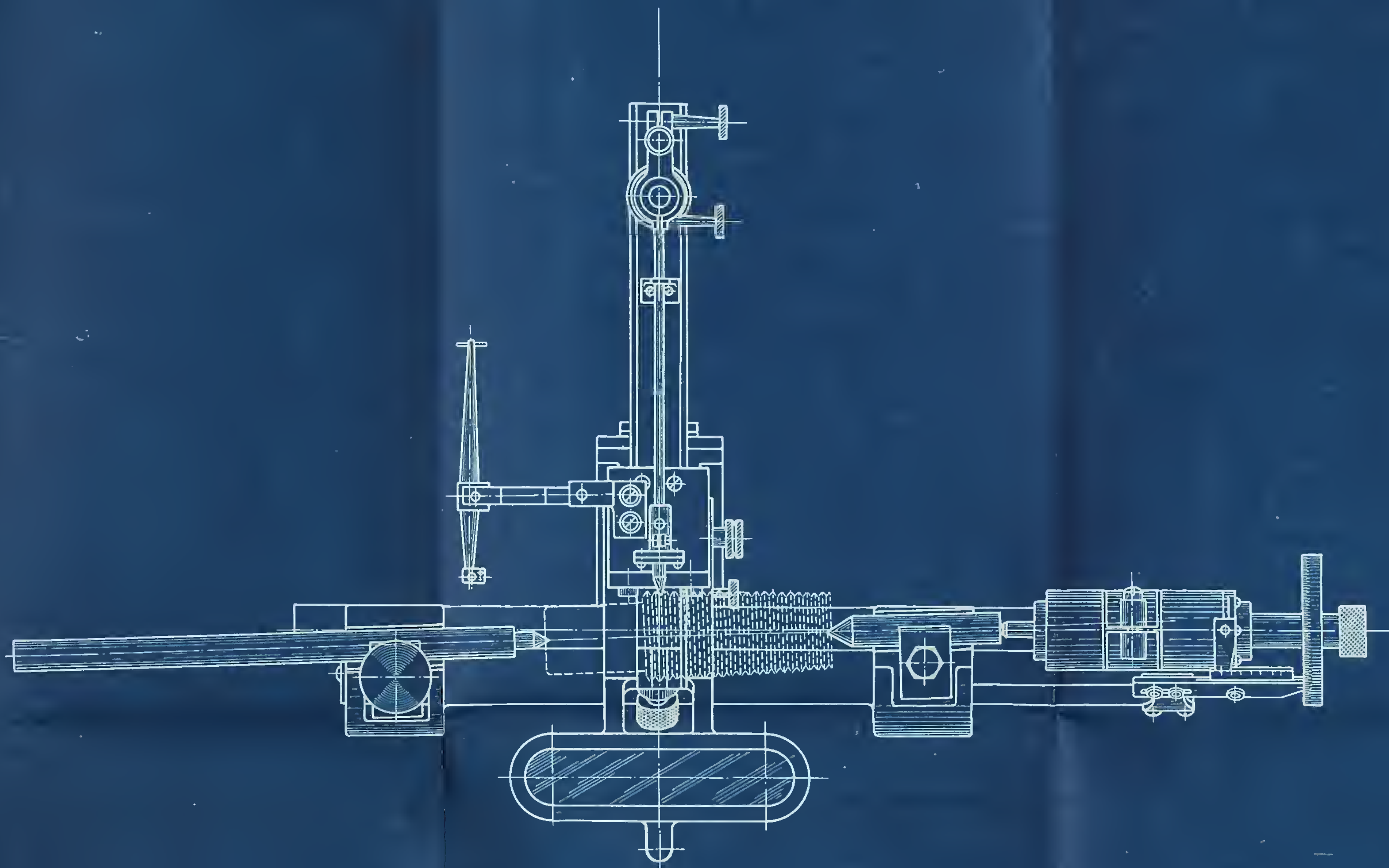
3	KNOB	1		
2	HINGES	2	BRS.	
1	TABLE	1	WOOD	
#	NAME	REQD	MATL	REMARKS

TABLE
PITCH TESTING DEVICE (TYPE "A").

DEPARTMENT OF COMMERCE	DRAWN A.G.W.	CHECKED U.S.G. 10/19
BUREAU OF STANDARDS	TRACED A.G.W. 10/19	APPROVED F.V.S.
WASHINGTON, D. C.	D1068	



D 1074



#	NAME	REQD	MATL	REMARKS
ASSEMBLY PLAN VIEW PITCH TESTING DEVICE (TYPE "B").				
DEPARTMENT OF COMMERCE		DRAWN	CHECKED	
BUREAU OF STANDARDS		TRACED	APPR'D.	
WASHINGTON, D.C.				

G.D.331

D 1074

