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H CATALOGUE **H**
SECTION

HYDRAULIC MACHINERY

VALVES,
PRESSES AND DRAW BENCHES,
POWER PUMPS AND
ACCUMULATORS.

BUILT BY

THE WATERBURY FARREL FOUNDRY
AND MACHINE COMPANY,
WATERBURY, CONNECTICUT, U. S. A.

1851-1907



THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY

DESIGNERS AND BUILDERS OF

"COLD PROCESS" RIVET
AND NUT MACHINERY

SINGLE AND DOUBLE
ACTING POWER PRESSES

MACHINES FOR MAKING
METALLIC CARTRIDGES

HYDRAULIC PRESSES,
PUMPS, ACCUMULATORS

WIRE AND TUBE MILL
MACHINERY

FINISHING TOOLS FOR
SHEET METAL MILLS

ROLLING MILLS FOR
SHEETS AND RODS

AUTOMATIC DROP HAMMERS
AND TRIMMING PRESSES

SHEARS AND ROTARY
SLITTERS

SPECIAL AND AUTOMATIC
MACHINERY

OFFICE AND WORKS,

WATERBURY, CONNECTICUT, U. S. A.

CABLE ADDRESS "FOUNDRY"

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The Waterbury Farrel Foundry and Machine Co.

CATALOGUE H

1907

INTRODUCTION

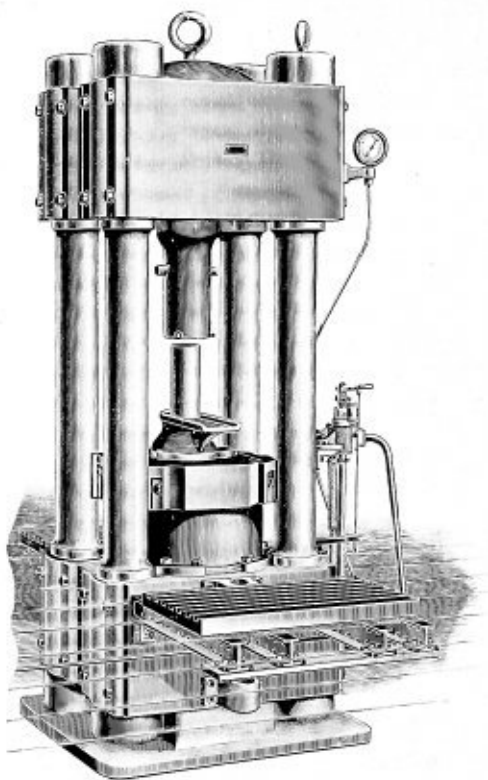
This catalogue describes **hydraulic machinery** used in various industrial operations, such as the manufacture of tubing of all kinds, either seamless or brazed, of steel, copper, brass, or other material; drawn rods and shafting; cups for tanks, hot water boilers, large cartridges, or similar articles; embossed and stamped coins, medals, and watch cases; punching thick blanks from sheet metal; heading, drawing, piercing, or other operations on large cartridges; stamping or pressing cold such articles as sprocket wheels, fancy hardware, leather, paper; squirting wire for fusible plugs and bullets; pressing and cooling composition eyelets, celluloid goods, insulating materials and emery wheels; testing tubing and cast iron water pipe; piercing and forming steel projectiles and bottles. In the tool room or machine shop a hydraulic press is useful for testing and hubbing dies, as a shear press for cutting off and trimming pieces of bar stock, or for any other miscellaneous work.

As occasion may arise we are prepared to **design and build new machines** for special purposes or to adapt those herein described to uses other than those for which they were originally planned. **Inquiries** of this character for machinery should be accompanied by samples of the work to be produced, or, if this is not possible, a description with drawings giving accurate figures and shapes should be sent. The daily production desired should also be given. The machines can be made to receive existing tools if so ordered, but unless especially agreed upon none are furnished with them.

We will plan and build the **piping and valves** suitable for connecting our pumps and accumulators with the machines they operate. Cartridge, steel and brass tubing, celluloiding and other plants will be furnished to suit customers. Valves of designs to meet conditions not fulfilled by those in this catalogue are made at special prices. The large number of drawings and patterns which we have accumulated make it possible to build these special valves at a minimum cost to the purchaser.

The important features of first class **materials** and ample proportions of parts accompanied by the **best workmanship** in construction are recognized and are consistently followed in the machines which are described in the following pages.

The ton mentioned throughout this catalogue is 2000 pounds and the gallon 231 cubic inches. (Approximately $7\frac{1}{2}$ gallons is one cubic foot.)



1500 Ton Hydraulic Embossing Press (1421)

Bypass Valve Patented July 30, 1895.

The illustration shows a press adapted for heading the large cartridge cases used in modern breech loading cannon. The tools shown are not included with the press. For sizes, etc., see page 6 H.

Standard Hydraulic Embossing Presses.

These presses are suitable for use in embossing watch cases, forming silverware, coining large medals, hubbing dies, heading cartridge cases or wherever a considerable pressure has to be applied slowly. The presses contained in the lists on pages 6 H and 7 H are of the same **general design** and a description of one applies equally well to all. The upright rods are of forged steel, finished all over. They pass through recesses in the platens, being held in place by caps, with enlarged ends bearing on the platens. The cylinder is of forged steel, copper lined, the lower platen forming the head, the water entering through it. The ram is cast iron, its top circular in plan but flatted off front and back to the figures given. It is guided by the four uprights. A leather packing ring keeps the joint between ram and cylinder tight. The platens are made of cast iron, the lower one resting on a base or foundation plate. We include with the press a gauge graduated for pounds pressure per square inch and total pressure in tons, one automatic bypass valve (see page 140 H) and foundation plans, bolts and plates if necessary.

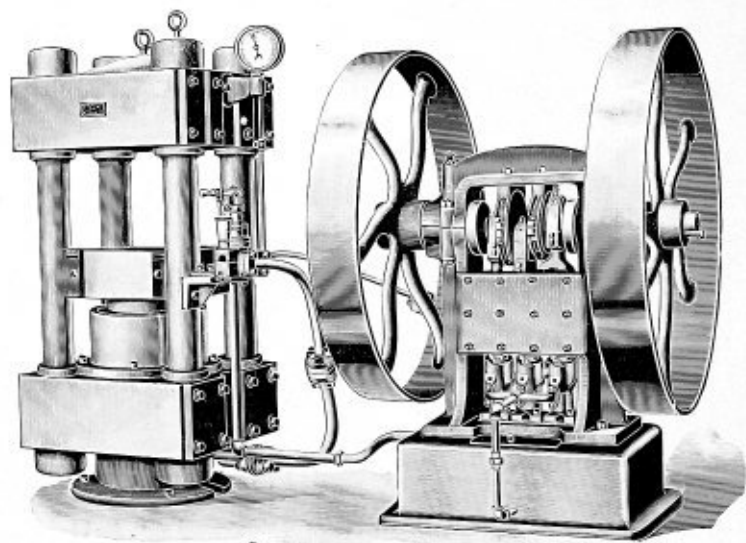
If ordered in connection with compound pump No. 1964 (page 127 H) we include **suitable piping** with the press as shown on page 9 H. If the pump and press are not located near each other, we make a small extra charge for this. Thus connected the machines are self contained and are semi-automatic in operation. By depressing a treadle the trip valve is closed and all the plungers of the pump acting together send the ram up rapidly until the work proper begins. Then the large low pressure plungers are automatically cut out, leaving the high pressure side to furnish water for the rest of the stroke. When any desired pressure is reached the trip valve acts and the ram falls, leaving the press ready to begin another stroke.

The illustration on page 8 H shows a press connected with a triplex pump. This arrangement is used when the stroke of the press is short, not over an inch, and, since the plungers of No. 977 are larger than those of the high pressure side of No. 1964, it gives a quicker motion to the ram. For a very slow motion of the ram, the method shown on page 139 H is recommended, or else the purchase of one of the small triplex pumps on page 124 H and attaching it in a manner similar to that shown on page 8 H.

The illustrations on pages 10, 12, 14 and 16 H show several **special plants** we have built and among them several methods of driving the pump from an electric motor are to be found.

Hydraulic Embossing Presses WITH STANDARD TIE RODS.

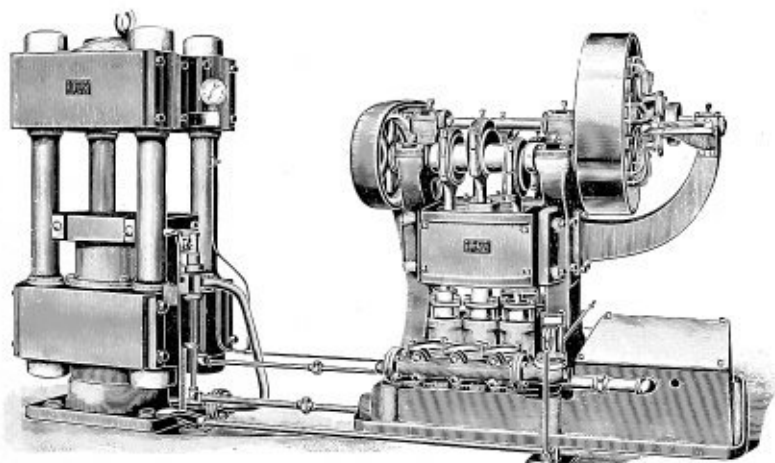
	1009A	2396A	1166A	2116A	2089A	1421A	3671	2090A	1963A
Capacity..... tons	450	550	650	950	1350	1850	2450	2850	3250
Working pressure.... lbs. per sq. in.	5850	6220	5730	6050	5970	6010	6090	5930	6050
Diameter of ram..... inches	14	15	17	20	24	28	32	35	37
Maximum stroke..... "	3½	4	4½	5	5	4	5	5	5
Top of ram, front to back.... "	18	18	20	22¾	26	29¾	33	35½	37
Top of ram, side to side (diameter)..... "	21	22	24	28	32	33	37	40	47
Top platen to ram when down..... "	17½	18	18	20	52	50	60	70	98
Opening between rods at front..... "	18¼	18½	20¼	23	30	30¾	34	36	37½
Opening between rods at side	13¾	12½	14¼	15½	12½	15¼	19	25	27
Floor space..... "	33x27	35x30	38x34	43x37	52x42	60x48	64x54	68x66	76x72
Extreme height..... "	69	72½	79½	92	137	143½	167	173	215
Weight..... pounds	8030	9680	13320	18550	32000	47050	66000	85550	11100
Price with automatic bypass valve \$									
For one inch increase in height, add \$									



450 Ton Hydraulic Press (2396) and Triplex Pump (977A)

Bypass Valve Patented July 30, 1895.

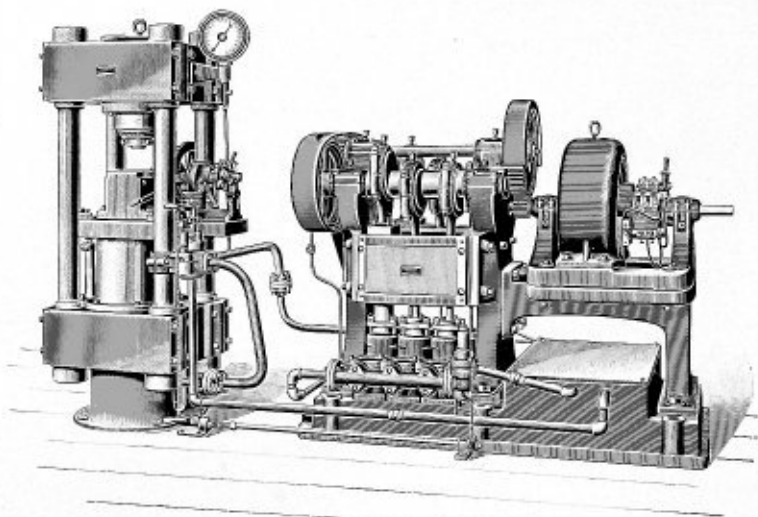
PRESS SPECIFICATIONS PAGE 6 H; PUMP, PAGE 117 H.



750 Ton Hydraulic Press (2116) and Compound Pump (1964)

Bypass Valve Patented July 30, 1895.

PRESS SPECIFICATIONS PAGE 6 H; PUMP, PAGE 127 H.



300 Ton Hydraulic Press (2568) and Compound Pump (2569)

With Bypass Valve and Knock Out.

Valve Patented July 30, 1895.



Geared Compound Pump (2569)

ELECTRICALLY DRIVEN

This pump is the same as No. 1964, page 127 H, except that it is driven by a 15 horse power electric motor, direct current, 230 volts, Crocker-Wheeler. Floor space is 7 feet 6 inches by 4 feet 9 inches.

Weight without Motor, 9830 lbs. Price without Motor, \$.....

300 Ton Hydraulic Medal Press (2568)

With Bypass Valve and Knock Out.

The illustration opposite shows a 300 ton Hydraulic Press with bypass valve, connected to compound pump, fitted with low pressure bypass valve and driven by 15 horse power electric motor. The main control valve is so designed that the total pressure in tons exerted by the ram on the work can be varied from 300 tons down and at this predetermined pressure each upward stroke ceases and the down stroke begins at once automatically. The length of the down stroke is determined by an **adjustable stop**.

The press is designed for **embossing medals** 3 inches diameter and smaller. It is provided with a **knock out motion** operated by a small electric motor attached to the press, and controlled by hand lever, as illustrated. Knock out weighs 500 lbs.

The press is substantially the same design as described on page 5 H, and the principal dimensions are given in the table below.



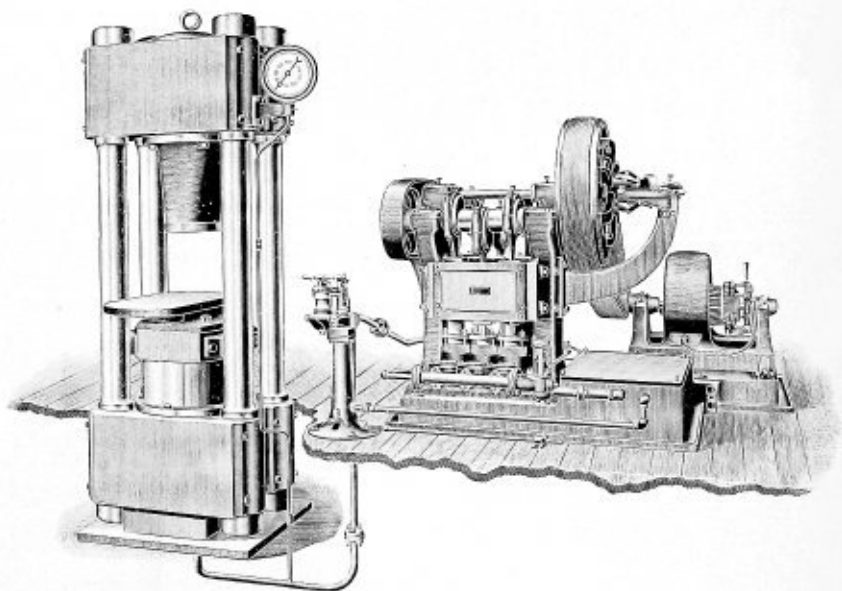
450 Ton Hydraulic Medal Press (3428)

Is of the same design as No. 2568 but has extra large openings through the water passages and valves to facilitate rapid down strokes. It is driven by No. 2569 pump.



HYDRAULIC MEDAL PRESSES.

Number of Machine	2568	3428
Capacity..... tons	300	450
Working pressure..... lbs. per sq. in.	4525	3535
Diameter of ram..... inches	13	18
Maximum stroke..... "	9	9
Top of ram, front to back..... "	18	20
Top of ram, side to side..... "	22½	26
Top platen to ram when down..... "	24¼	24¼
Opening between rods at front..... "	18	20¼
Opening between rods at side..... "	13½	14¼
Floor space..... "	39 by 27	44 by 35
Extreme height..... "	78¾	81¾
Weight, with knock out..... pounds	8830	13400
Price, with bypass valve..... \$	.....	.....
Price of knock out and its motor, extra.. \$	.....	.....



1000 Ton Hydraulic Press (2666) and Compound
Power Pump (2667)

Bypass Valve Patented July 30, 1895.

1000 Ton Hydraulic Press (2666)

WITH CHECK CONTROL VALVE.

Whenever the use to which an embossing press is put demands that the pressure on the work shall run up to a predetermined amount and remain there for some time, the valves shown in the illustration can be used to control the operation. They are two in number, one similar to our No. 1371, page 140 H, the other a check valve used to hold the pressure on the press while the supply from the pump is by-passed. Both are included in the price below. The press is No. 2089, page 6 H, fitted with the punch and table shown. Speed of ram with both high and low pressure plungers, 40 inches per minute, with high pressure plungers only, 18-10 inches per minute. Capacity, 1000 tons; working pressure 6400 pounds per square inch; ram, 20 inches diameter; maximum stroke, 5 inches; top of ram, 26 inches front to back, 32 inches side to side; top platen to ram when down, 52 inches; opening between rods at front, 30 inches, at side, 12½ inches; floor space of press, 52 by 42 inches; extreme height, 137 inches; punch, 26 inches long; table, 8 inches thick, 24 inches wide on top, 12 inches center of press to back edge and 32 inches to front edge.

Weight, 33400 pounds. Price with bypass valve, \$.....



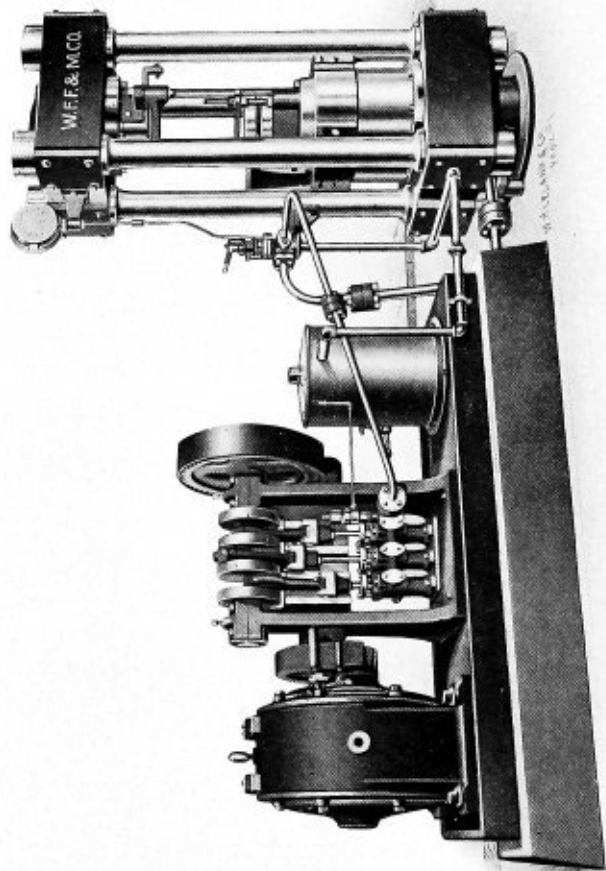
Geared Compound Power Pump (2667)

ELECTRICALLY DRIVEN.

This is No. 1964, page 127 H, which has three 4 inch low pressure and three 7/8 inch high pressure plungers, all with a 5 inch stroke, and a 36 by 9 inch friction clutch pulley belted to a 15 horse power 220 volt direct current General Electric motor. The pump will deliver 12000 cubic inches per minute against 300 pounds per square inch pressure from the low pressure side and 575 cubic inches against 8000 pounds from the high pressure side; floor space, 96 by 106 inches. This pump geared to a motor is shown on page 10 H.

Weight, without motor, 9820 pounds. Price, \$.....

Weight of motor, 1710 pounds. Price, extra, \$.....



500 Ton Hydraulic Heading Press and Triplex Pump (Motor Driven)

Bypass Valve Patented July 30, 1895.

500 Ton Hydraulic Heading Press and Triplex Power Pump.

MOTOR DRIVEN.

This illustration shows one of our special hydraulic presses in connection with a motor driven pump. The motor, tank and pump are mounted on a separate base plate, and all are set on a solid foundation, the floor line being at the level of the bottom of the base under the pump.

This machine was designed for heading small cartridge cases, a suitable hand ejector being clamped to one of the rods as shown, and a swinging punch holder having places for two punches is provided. The press is controlled by an automatic bypass valve, which stops the upward stroke of the main ram at any predetermined pressure, and at once the ram begins its return stroke. The cylinder is made of forged steel and lined with copper, and is securely bolted to the bottom platen. The tank is made of copper throughout, and securely bolted to base. All piping is of brass. The motor is a 15 horse power, induction type, 200 volts, 7200 alternations, Westinghouse.

SPECIFICATIONS.

PRESS (2900)		PUMP (2901)	
Capacity.....	tons 500	Diameter of plunger.....	in. 1 7/8
Diameter of ram.....	in. 16	Stroke.....	" 6
Maximum stroke of ram.....	" 5	Approximate capacity, cubic	
Diameter top of ram.....	" 22	inches.....	1060
Top platen to ram when down.....	" 40	Pressure, lbs. per sq. in.....	4975
Opening between rods.....	" 18 1/2 by 12 1/2	R. p. m. of crankshaft.....	61 1/2
Floor to top of ram.....	" 26	Ratio of gearing.....	13.67 to 1
Size of supply pipe.....	" 1 1/2xx	Floor space.....	in. 91 by 32
Floor space, with pump.....	" 165 by 36	Price of tank, pump and	
Extreme height from floor.....	" 82 1/2	base.....	\$
Total weight, including motor.....	lbs. 17175	Price of motor extra.....	\$
Price, press, pump, tank and motor \$			

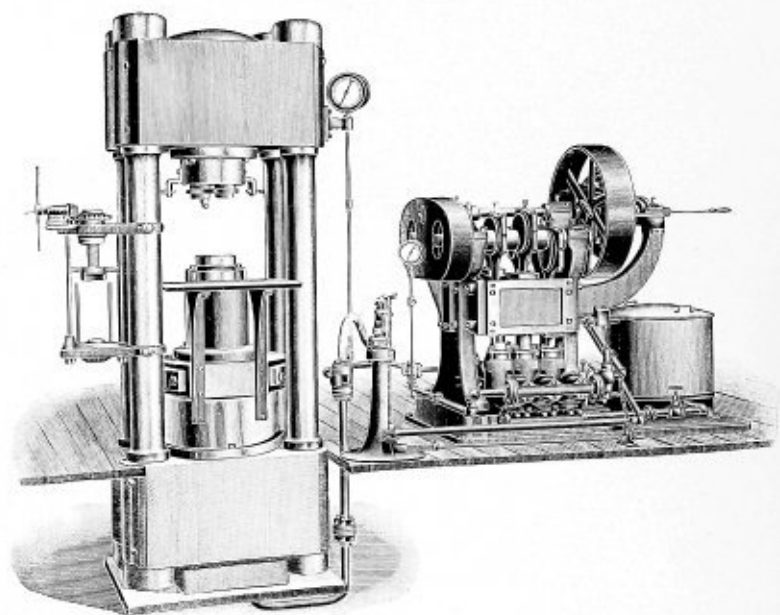
1500 Ton Hydraulic Heading Press (3116)

is used with pump 2699 (page 17 H) for heading cartridge cases; the fixtures used with it are a swinging punch holder for two punches; a bolster block with three fillers; and a suitable adjustable feed table and stop. The valve and piping to the pump are furnished also. Working pressure, 5650 pounds per sq. inch; ram, 26 inches diameter, 6 inches stroke; top of ram, 29 3/4 inches front to back, 33 inches side to side; top platen to ram when down, 50 inches; opening between rods at front, 30 3/8 inches, at sides 15 1/4 inches; floor space of press, 48 by 60 inches; extreme height, 145 1/2 inches.

Weight, 45780 pounds. Price with bypass valve, \$.....

Special Knock Out and Feed, 2090 A, is used with press 2090, page 6 H; it is driven by an independent steam pump.

Weight, 8270 pounds. Price, \$.....



1000 Ton Hydraulic Heading Press (2698) and Geared
Compound Power Pump (2699)

Bypass Valve Patented July 30, 1895.

1000 Ton Hydraulic Heading Press (2698)

The cut opposite shows one of our embossing presses, see page 5 H, connected up with a compound pump, the combination being designed for heading cartridge cases. For this purpose press No. 2089, page 6 H, has been fitted with blank punches and dies for heading and with a screw stripper for removing the case from the heading fixtures. The valve supplied with the press is of a similar design to our No. 1371, page 140 H, and it is adjustable so as to govern the maximum pressure exerted by the press. Speed of ram with high pressure plungers only acting, 18-10 inches per minute, with both high and low pressure plungers, 40 inches per minute. Capacity, 1000 tons; working pressure, 6400 pounds per square inch; ram, 20 inches diameter; maximum stroke, 5 inches; top of ram, 26 inches front to back, side to side, 32 inches; top platen to ram down, 51 inches; opening between rods at front, 30 inches, at side, 12½ inches; floor space of press, 52 by 42 inches; extreme height, 136 inches.

Weight, 33735 pounds. Price with bypass valve, \$.....



Geared Compound Power Pump (2699)

The pump shown opposite is our No. 1964, page 127 H, with all water passages made of bronze and with a bronze tank. There are three low pressure plungers, 4 inches in diameter, and three high pressure plungers, ⅞ inch diameter, all 5 inches stroke. They will deliver 12000 cubic inches per minute against 300 pounds per square inch pressure from the low pressure side and 575 cubic inches against 8000 pounds from the high pressure side; the friction clutch pulley is 36 inches diameter, 9 inches face and runs 200 revolutions per minute; floor space, 74 by 54 inches.

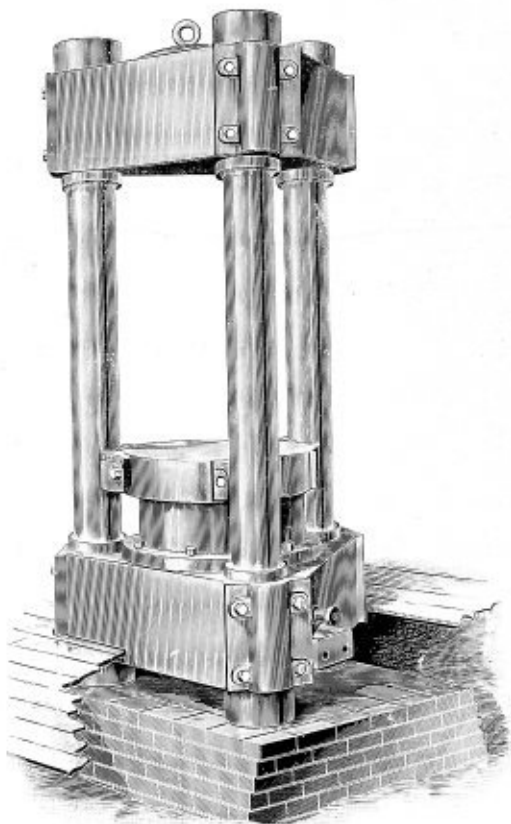
Weight, 7950 pounds. Price, \$.....



3000 Ton Hydraulic Heading Press (2697)

is used with compound pump No. 2699 for heading large cartridge cases. The general design and arrangement of the press is shown on photo 875. The fixtures included in the price and weight below are a swinging punch holder, a die holder and carriage arranged to slide forward so that the work can be lifted from the die, air cylinder for actuating the slide, air hoist, air valves, knock out block and slide. The valve and piping for connecting press and pump are furnished also. Working pressure, 5600 pounds per square inch; ram, 37 inches diameter, maximum stroke, 6 inches; top of ram 37 inches front to back, 47 inches side to side; top platen to ram down, 83 inches; opening between rods at front, 37½ inches; at side, 27 inches; floor space of press, 123 by 86 inches; extreme height, 200 inches.

Weight, 115000 pounds. Price with bypass valve, \$.....



550 Ton Three Rod Hydraulic Press (996)

The illustration shows how a press can be built with three upright rods instead of four. The three rod presses are in all other respects like the four rod machines described on page 5 H. Capacity, 550 tons; working pressure, 3500 pounds per square inch; diameter of ram, 20 inches; maximum stroke, 4 inches; diameter of top of ram, 30 inches; top platen to ram when down, 42 inches; opening between rods, $27\frac{1}{4}$ inches; floor space, 50 by 44 inches; extreme height, 97 inches; difference for one inch change in height of press, \$

Weight, 15520 pounds. Price with bypass valve, \$

Special Embossing Presses.

Several classes of special embossing presses are described on the following pages. These include wide spread, double ram, steam plate, solid frame, screw and cabbaging presses as well as small presses for general machine shop work.



Hydraulic embossing press No. 1113 is of 800 tons capacity with a wide opening at front. It has four rods and is of the same general design as No. 2396 (page 8 H). It is used in **emery wheel making**. Working pressure, 3000 pounds per square inch; ram, 26 inches diameter; maximum stroke, 10 inches; top of ram, 46 inches square; top platen to ram when down, 21 inches; opening between rods at front, 46½ inches, at side, 22½ inches; floor space, 68 by 46 inches; extreme height, 108½ inches; difference for 1 inch change in height, \$

Weight, 46100 pounds. Price with bypass valve, \$.....



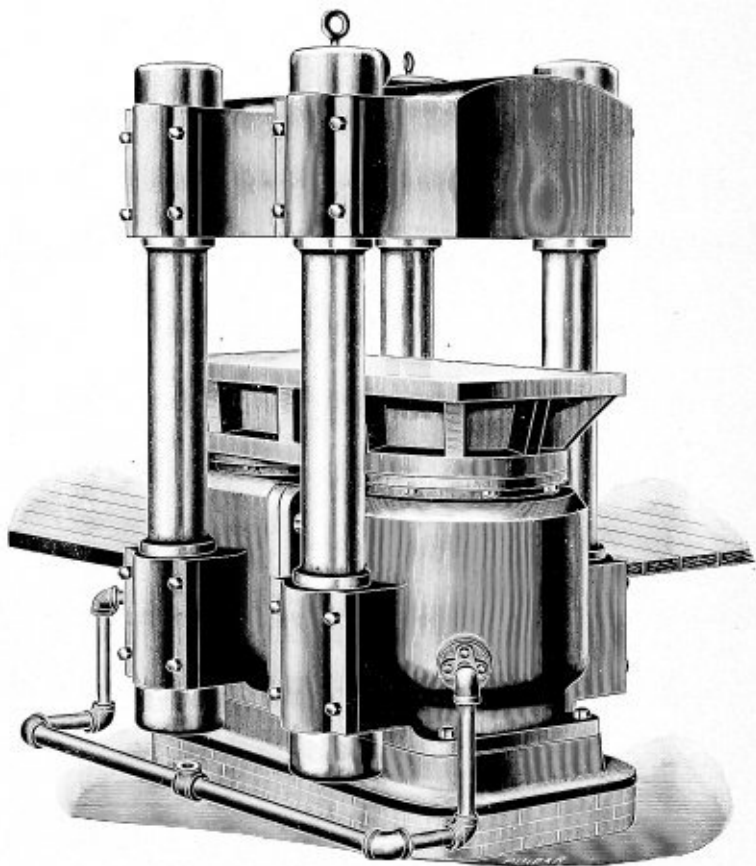
Hydraulic embossing press No. 1962 has a wide opening at the front and has more than the usual distance from the top platen to the top of the ram. (Photo 427.) It has four rods and resembles No. 2396 in design. It is used in cartridge making. Capacity, 750 tons; working pressure, 4800 pounds per square inch; ram, 20 inches diameter; maximum stroke, 8 inches; top of ram, 33 inches square; top platen to ram when down, 62 inches; opening between rods at front, 37 inches, at side, 14 inches; floor space, 56 by 40 inches; extreme height, 149 inches; difference for 1 inch change in height, \$

Weight, 31870 pounds. Price with bypass valve, \$.....



Hydraulic press No. 1261 is a four rod machine designed for use in making wire by squirting lead or fusible metal through a die. The general design of the press is that of No. 1238 (page 34 H). The die is held in a suitable holder just under the top platen and the ingot of metal, 16 inches long and 2½ inches diameter, is placed in it. The ram starts up and a punch, carried on its upper end, forces the metal through the die. The holder and die are heated by a steam coil. Capacity, 120 tons; working pressure, 3080 pounds per square inch; ram, 10 inches diameter; stroke, 16½ inches; top of ram, 13 inches diameter; top platen to ram when down, 45¾ inches; opening between rods at front and side, 21 inches; floor space, 32 inches square; extreme height, 87¾ inches. No valves are included with the press, but a die holder is.

Weight, 5656 pounds. Price, \$.....



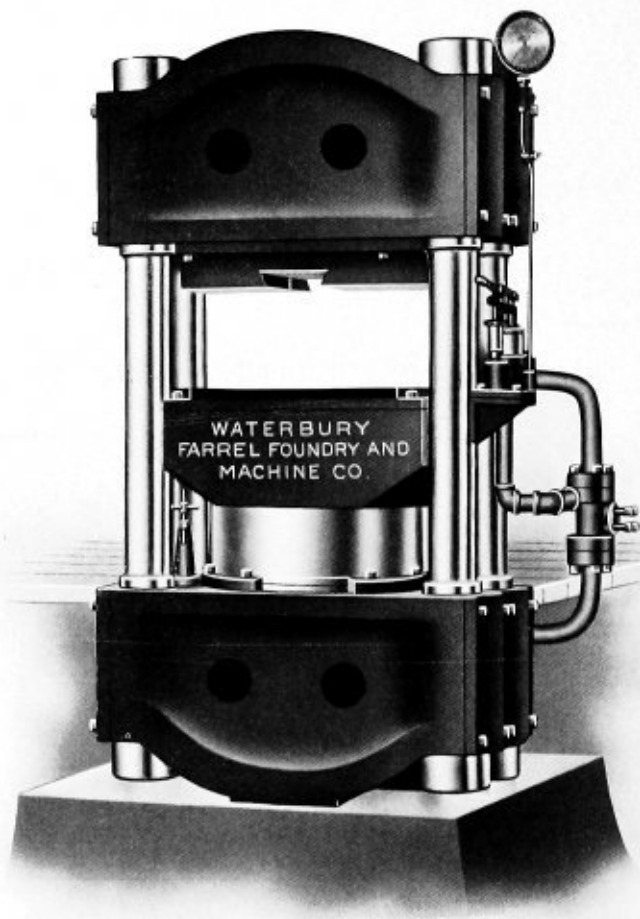
1225 Ton Double Ram Hydraulic Press (2928)

1225 Ton Double Ram Hydraulic Press (2928)

This tool is designed for use where a long narrow piece of work has to be pressed and for this class of operations the double ram press is advantageous on account of the economy in material resulting from the design. The press is made from cast iron except that the tie rods are hammered steel; the ram is leather packed; no valve is furnished with the press (No. 3484 A, page 141 H is suitable for use when embossing or kindred operations are carried on).

SPECIFICATIONS.

Capacity.....	tons	1225
Working pressure.....	lbs. per sq. in.	2500
Diameter of rams.....	inches	25
Maximum stroke.....	"	10
Top of ram, front to back.....	"	70½
Top of ram, side to side.....	"	32
Top platen to ram, when down.....	"	18
Opening between rods at front.....	"	36
Opening between rods at side.....	"	28
Size of inlet pipe.....	"	2xx
Floor to top of ram.....	"	27
Floor space.....	"	76 by 57
Extreme height.....	"	97
Weight.....	pounds	46515
Price, without valve.....	\$	.....



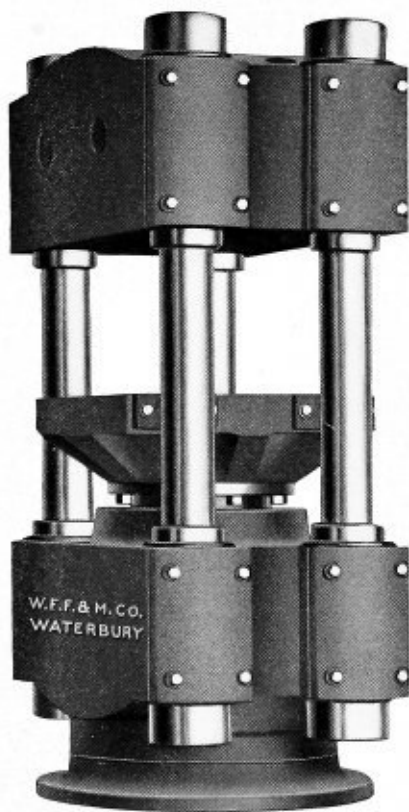
1000 Ton Hydraulic Press (3484)

1000 Ton Wide Spread Hydraulic Press (3484)

This press in connection with compound pump No. 1964, page 127 H, is used for stamping cold steel register tops and in order to take in the large sizes it has been made **extra wide** between the tie rods. The top and bottom platens are of cast iron, suitably ribbed to insure sufficient strength; the ram and crosshead are cast iron, guided on the tie rods; the bolster plates are of cast iron, the upper one dovetailed for holding the punch holder; the cylinder is forged steel, the ram being leather packed; the tie rods are hammered stock, held in place on the platens by cast iron caps; the valve is No. 3484 A, page 141 H, and is so designed that pressure on the treadle starts the upward stroke of the ram, which stops and begins its return stroke automatically on attaining a predetermined pressure. This maximum thrust exerted by the press is adjustable.

SPECIFICATIONS.

Capacity.....	tons	1000
Working pressure.....	lbs. per sq. in.	5260
Diameter of ram.....	inches	22
Maximum stroke.....	"	5
Top of ram, front to back.....	"	24
Top of ram, side to side.....	"	38
Top platen to ram when down.....	"	25
Top bolster to bottom bolster, ram down.....	"	14
Opening between rods at front.....	"	39½
Opening between rods at side.....	"	6½
Floor space of press and valve.....	"	30 by 64
Floor space of press, pump and piping.....	"	157 by 88
Base sets below the floor.....	"	28
Extreme height.....	"	103½
Weight of press and bypass valve.....	pounds	22530
Price of press and bypass valve.....	\$	.....



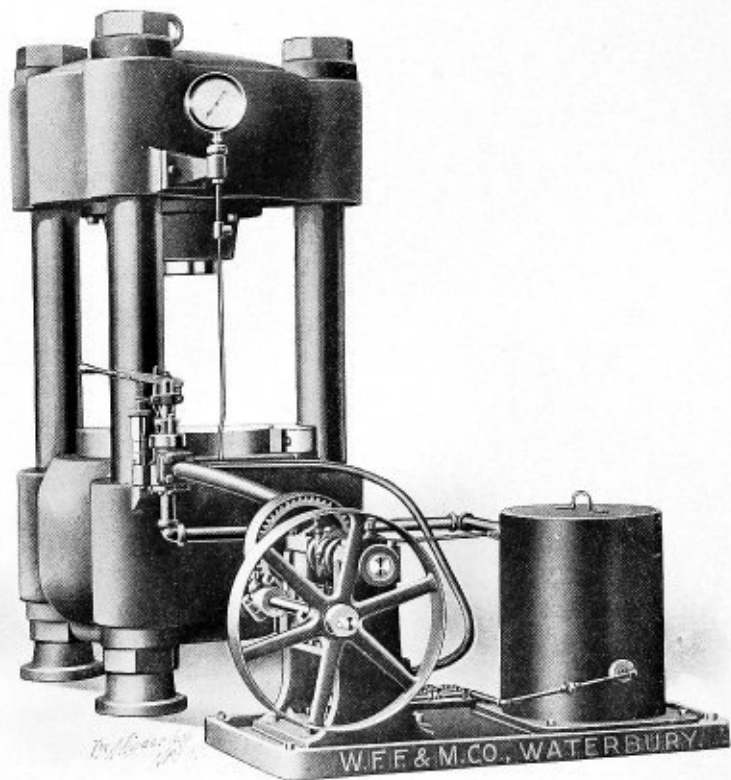
600 Ton Hydraulic Press (3242)

600 Ton Hydraulic Embossing Press (3242)

The illustration on the opposite page shows a four rod press made with the cylinder and bottom platen cast in one piece from steel. The top platen is ribbed and is of strong cast iron; the crosshead and ram are cast iron, the ram working in a **copper lined cylinder**; the crosshead is guided on the tie rods, which are of forged steel; the ram is packed by leather held on the end of the ram. No valve or gauge is furnished with the press. A suitable automatic bypass valve is No. 3428 A, page 141 H.

SPECIFICATIONS.

Capacity.....	tons	600
Working pressure.....	lbs. per sq. in.	5970
Diameter of ram.....	inches	16
Stroke of ram.....	"	12
Top of ram, front to back.....	"	30
Top of ram, side to side.....	"	30
Top platen to ram when down.....	"	18
Opening between rods at front.....	"	32¼
Opening between rods at side.....	"	13¼
Floor space.....	"	50 by 39
Extreme height.....	"	87½
Supply pipe.....	"	1½xx
Weight, without valve.....	pounds	17340
Price, without valve.....	\$	.....



600 Ton Hydraulic Press.

The every day demands on the tool department of a factory frequently call for the use of a **powerful short stroke** hydraulic press. We have designed the machine shown above for this work and we offer it either in connection with geared triplex pump and tank 2609 (page 123 H) and bypass valve 1371 (page 140 H) or with geared triplex pump and tank 3054 (page 120 H) and bypass valve 1371 (page 140 H). The specifications for the press are on the opposite page. A suitable gauge is furnished with the press, all parts of which (except the steel tie rods) are of cast iron.

600 Ton Hydraulic Press (3460)

Illustrated and described opposite.

SPECIFICATIONS.

Capacity of press.....	tons	600
Working pressure.....	lbs. per sq. in.	2650
Diameter of ram.....	inches	24
Maximum stroke.....	"	7
Diameter of top of ram.....	"	26
Top platen to ram, when down.....	"	30
Diameter of plug in punch.....	"	11 $\frac{3}{4}$
Bottom of plug to ram, when down.....	"	21
Opening between rods.....	"	29 $\frac{1}{2}$
Floor to top of ram.....	"	36
Extreme height.....	"	91
Floor space of press.....	"	46 by 58
Weight of press with valve.....	pounds	15315
Price of press including valve and gauge.....	\$	.....

Press 3460 will have the speed of the ram on the upward stroke about $\frac{1}{2}$ inch a minute if driven by pump 2600. Price of press, pump and piping complete as shown in the cut on the opposite page, \$..... Drawing No. 3537 embodies this combination and the floor space is 104 by 61 inches.

Press 3460 will have the speed of the ram on the upward stroke about 2 inches a minute if driven by pump 3054. Price of press, pump and piping, \$..... Floor space, 106 by 63 inches.

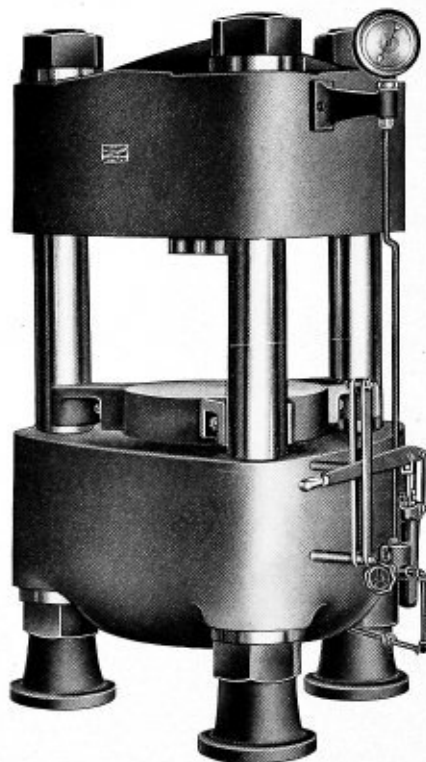


550 Ton Four Rod Hydraulic Press (3506)

This press has the ram acting from below, the cylinder and lower platen being combined in one steel casting; the ram is cast iron, packed by flax packing held in place by a gland; the tie rods are forgings, turned to form a guide for the crosshead and held by caps in place on cylinder and upper platen; the upper platen, crosshead and guides are cast iron. No valves or piping are furnished with the press but a gauge is. The press is held up by I beams resting on a foundation.

Capacity, 550 tons; working pressure, 2430 pounds per square inch; ram, 24 inches diameter; 28 inches stroke; top platen to ram when down, 52 $\frac{1}{4}$ inches; opening between rods at front, 35 $\frac{1}{2}$ inches, at side, 18 $\frac{1}{2}$ inches; extreme height, 168 inches; floor space, 51 by 56 inches; size of inlet pipe, 2xx.

Weight, 33600 pounds. Price, \$.....



450 Ton Hydraulic Press (520)

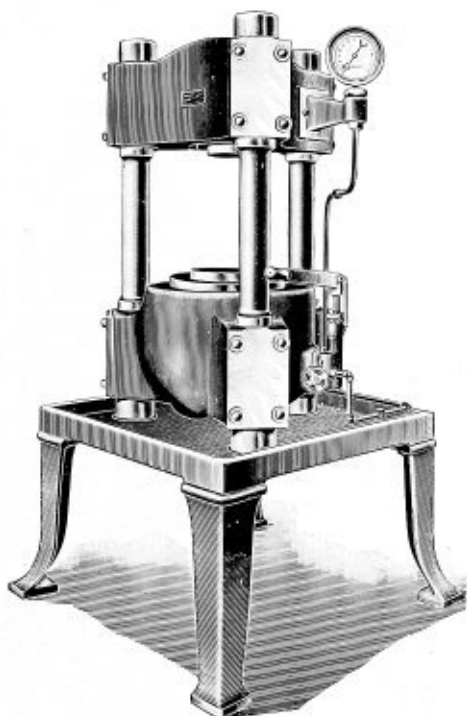
This press has a tank, gauge, controlling valve and hand pump attached to it, and it makes a compact outfit for operations (such as testing) which are but occasionally demanded. If the press is to be constantly used a belt driven pump should be substituted for the hand pump, the motion imparted to such a large ram by any hand pump being extremely slow. Pump No. 2, page 123 H, with $\frac{3}{4}$ inch plunger is suitable for this press.

The cylinder, ram and top platen are cast iron, the tie rods forged steel; the ram is packed by leather held in a recess in the cylinder. There is a hardened steel plug $11\frac{1}{2}$ inches in diameter projecting two inches from the top platen which distributes the pressure evenly over the surface of the platen.

Capacity of press, 450 tons; working pressure, 2870 pounds per square inch; maximum stroke, 5 inches; ram, 20 inches in diameter; plug to ram when down, 14 inches; opening between rods about $25\frac{3}{8}$ inches; floor space, 40 by 41 inches; extreme height, 71 inches; diameter of pump plunger, $\frac{5}{8}$ inch.

Weight, 10990 pounds. Price, \$.....

Price without hand pump but with bypass valve, \$.....

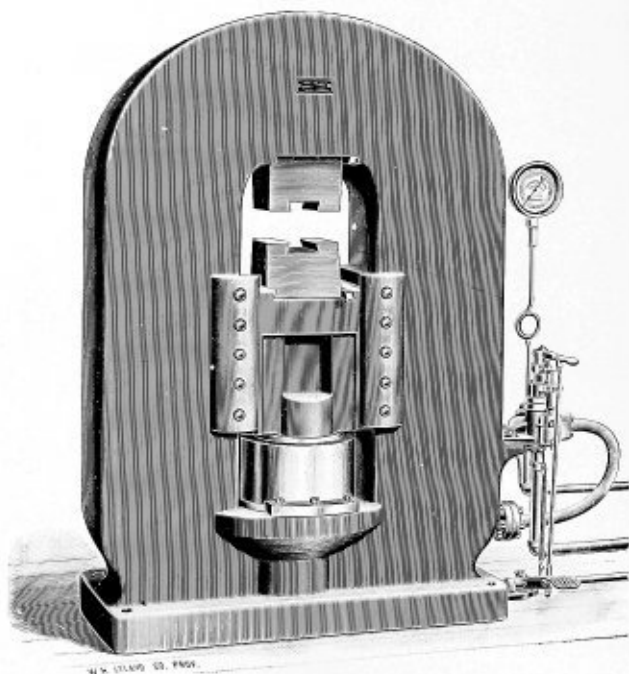


250 Ton Hydraulic Press (1807)

This illustration shows an hydraulic press with hand pump, hand valve, tank and pressure gauge all mounted together, making a compact self-contained apparatus for embossing medals or similar work, or hubbing dies. A hardened tool steel plate 6 inches in diameter projecting 1 inch below the top platen is let into the center of it in order to distribute the pressure. Four $\frac{3}{4}$ inch holes, located 90 degrees apart on a $4\frac{1}{4}$ inch radius, are tapped in the top of the ram.

SPECIFICATIONS.

Capacity.....	tons	250	Floor to top of ram, when down	ins.	42 $\frac{1}{2}$
Working pressure....	lbs. per sq. in.	5260	Opening between rods.....	"	19 $\frac{3}{4}$
Diameter of ram.....	ins.	11	Diameter of the rods.....	"	3 $\frac{1}{2}$
Maximum stroke.....	"	4	Floor space, about.....	"	43 by 49
Diameter of top of ram.....	"	11	Extreme height.....	"	73
Top platen to ram, when down	"	16	Weight.....	lbs.	4060
Price, complete, \$					



400 Ton Solid Frame Hydraulic Press (1751)

Bypass Valve Patented July 30, 1895.

The machine shown above is designed to guide the ram with **extreme accuracy** and to make the dies more accessible from the front than is possible with the three and four rod machines. The frame is of cast iron, in one piece, and has carefully fitted in the opening a crosshead which carries the lower die. The upper die is held in the frame itself. The cylinder and ram are similar to those in the standard presses. The crosshead rests on the ram but is not fastened to it. Capacity, 400 tons; working pressure, 6050 pounds per square inch; diameter of ram, 13 inches; extreme stroke, 4 inches; top of crosshead, $12\frac{1}{2}$ inches wide; top of opening to crosshead when down, 16 inches; width of opening, 19 inches; floor space, 61 by $24\frac{1}{2}$ inches; extreme height, $82\frac{3}{4}$ inches.

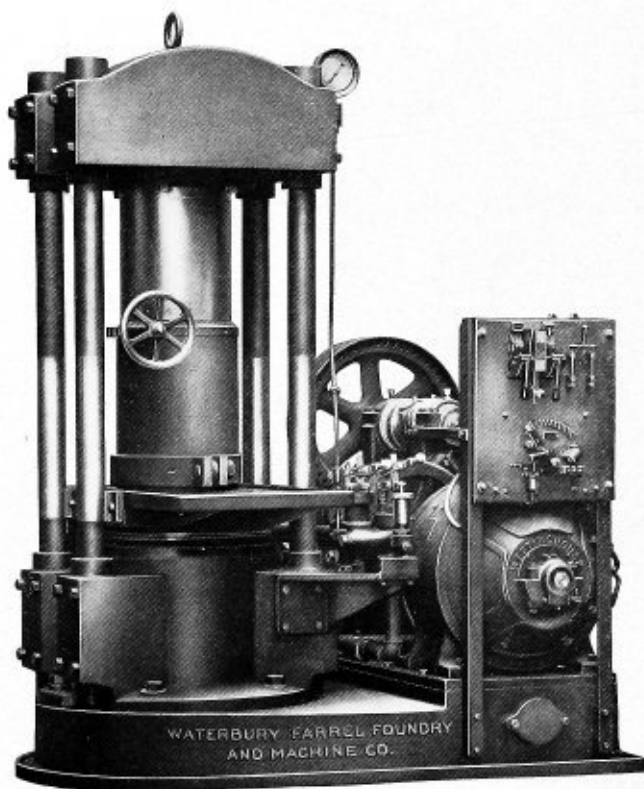
Weight, 14500 pounds. Price with bypass valve, \$.....



170 Ton Screw Hydraulic Press (1587)

The cut shows a special two rod hydraulic press with the upper platen adjustable up and down by means of a screw and hand wheel. It is useful for tool room or machine shop work. Capacity, 170 tons; working pressure, 3000 pounds per square inch; ram, 12 inches diameter; stroke, 12 inches; top of ram, 29½ inches diameter; top platen up to ram when down, 23 inches; adjustment of top platen, 7 inches; between rods, 30 inches; diameter of hand wheel, 36 inches; floor space, 45 by 36 inches; extreme height, 102 inches. Suitable pump or valves can be furnished with this press at a small extra cost, but none are included with it.

Weight, 9560 pounds. Price, \$.....



200 Ton Hydraulic Caking Press (3365)
and Triplex Pump, Motor Driven.

200 Ton Hydraulic Caking Press (3365)

WITH CHECK CONTROL VALVE.

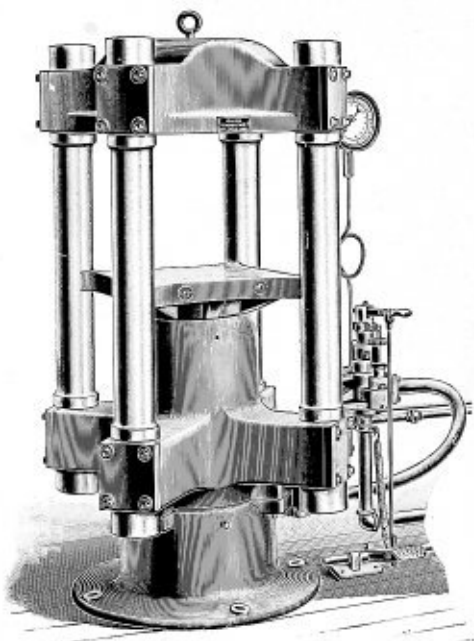
The machine shown in the half tone is used for squeezing the liquid out of the silver mud obtained in assaying. It consists of a four rod hydraulic press mounted on the same base with a motor driven geared triplex pump and is provided with suitable valves and controlling devices for the electric current. The cylinder is of cast iron, **copper lined** and the ram that works in it is also of cast iron, leather packed on the end and screwed to the crosshead; the crosshead is guided on the tie rods and is provided with suitable gutters for removing the liquid that comes from the die; the top platen is cast iron suitably ribbed and the forged steel tie rods are capped into it and into the cylinder; the base is cast iron and contains a tank provided with suitable cleaning holes; all piping and valves are bronze; a gauge is furnished with the press; the die is sectional, clamped at top and bottom and fitting loosely the cast iron punch.

The operation of the press is as follows; the ram being down, the die is drawn forward and filled, then returned to its place and the ram is started up and squeezes out the liquid from the mud; at the top of the stroke the top clamp is tightened by the hand wheel and the lower clamp loosened; the ram during these changes has been held up automatically by a check valve which is now opened and allows the ram to drop far enough to allow the pressed cakes to drop onto the crosshead. Next the ram goes up again and the die is loosened from the punch and goes down with the ram ready for another stroke. The press is fitted with an automatic valve which stops the upward motion of the press whenever a predetermined pressure is reached; this pressure being adjustable.

The pump is one of our standard sizes and is designed to run continuously; it is directly geared to a 220 volt, 7½ H. P., direct current Westinghouse motor which is enclosed; all pinions in the drive are rawhide; the controlling devices include a line switch, a circuit breaker and an underload and overload starting box.

The press ram travels up 6 inches a minute; the silver cakes are 15 inches diameter, three in number, each about 1½ inches thick and the die is 22 inches high; ram, 20 inches diameter and 18 inches stroke; working pressure 1275 pounds per square inch; pump cylinders 2 inches diameter, 4 inches stroke, three in number each making about 59 strokes per minute; floor space, 80 by 60 inches; height, 97 inches. See also photo 1376.

Weight, 17300 pounds. Price, \$.....



200 Ton Hydraulic Press (1238)

Bypass Valve Patented July 30, 1895.

The illustration shows a four rod press with the cylinder and bottom platen one steel casting. This press can be used for embossing, drawing or other operations, just as the presses described on page 5 H are used, or it may be equipped with steam plates as described on the opposite page. Automatic valve No. 1371 is included with the press. For dimensions, consult the table opposite. The cylinder is copper lined, the ram, leather packed on its end.

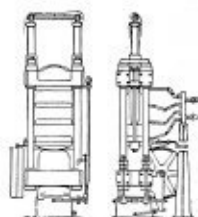


No. 3453 combines press 1238 (described above) with a 1 by 4 inch geared triplex pump (No. 3054, page 120 H), the necessary piping and a tank being included. Press specification is as given opposite for No. 1238, except that the top platen to ram down is 18 inches. The pump moves the press ram about $6\frac{1}{2}$ inches per minute; floor space, 51 by 100 inches. Weight and price include press, bypass valve, gauge, piping, tank and pump.

Weight, 7400 pounds. Price, \$.....

Steam Plate Hydraulic Presses.

For hot and cold pressing various substances and compositions we make the hydraulic presses described below, which have plates fitted with **steam and water circulation**. The outline cut shows such plates in a press as well as the method of connecting them by jointed pipes to the supply stand. There are four plates 20 by 16 inches, 3 inches thick, spaced 6 inches apart. The ram is returned quickly by the auxiliary cylinders shown on top. Pump No. 1239 (page 139 H) is shown attached to the press, the belt shifter being conveniently located at the left hand. Plug valves, opened and closed by small hand wheels, control the ram which may be kept up as long as desired. This press has the base and cylinder combined in a steel casting, the ram being packed by a leather ring held in the casting.



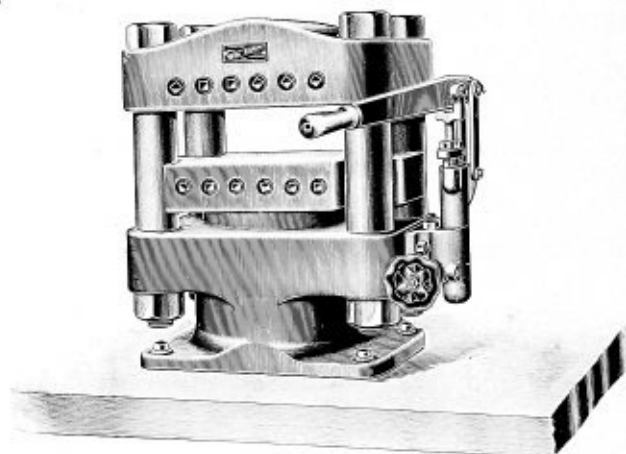
(1256)

Steam Plate Hydraulic Press (1191)

This press is similar to No. 1256 but it has no return cylinders. It is designed to carry 13 plates 2 feet square and 2 inches thick, spaced 1 inch apart, for hot or cold pressing. The base and cylinder are cast iron, the ram being packed by a leather ring held in place by a steel gland. Sizes and weights are in the table below. The press is designed to work from an accumulator system. Our accumulators are described on page 95 H.

200 Ton Presses.

Number of Machine	1191	1238	1256
Capacity..... tons	200	200	200
Pressure..... lbs. per sq. in.	2280	5100	5100
Diameter of ram..... inches	15	10	10
Maximum stroke..... "	10	14	16
Top of ram, front to back..... "	24	16	16
Top of ram, side to side..... "	24	20	20
Top platen to ram when down..... "	38	28	30
Opening between rods at front..... "	26 $\frac{1}{4}$	20 $\frac{1}{4}$	21 $\frac{1}{4}$
Opening between rods at side..... "	20 $\frac{1}{4}$	20 $\frac{1}{4}$	8 $\frac{1}{4}$
Floor space..... "	40 by 36	34 by 34	46 by 44
Extreme height..... "	79 $\frac{1}{2}$	81	111
Weight of plain press..... pounds	9400	5300	5300
Weight of press and plates..... "	11600	—	6400
Weight of press, pump, and plates..... "	—	—	6950
Price of plain press..... \$	—	—	—
Price of press and plates..... \$	—	—	—
Price of press, pump and plates.. \$	—	—	—



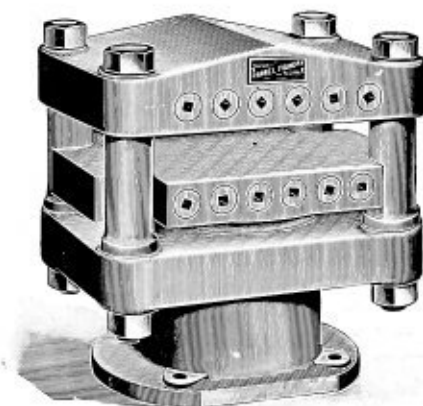
40 Ton Hydraulic Press (2000 A)

WITH HAND PUMP (3067).

This press is used in celluloid or similar work. It is provided with openings for water circulation in the top platen and the top of the ram. The ram is pumped up by the hand pump until the desired pressure is reached; it is then held at this pressure until released by the valve operated by the hand wheel, when the ram settles to its bottom position. A pressure gauge is furnished as an extra.

SPECIFICATIONS.

Capacity.....	tons	40
Working pressure.....	lbs. per sq. in.	2100
Diameter of ram.....	inches	7
Maximum stroke.....	"	2
Top of ram, front to back.....	"	12
Top of ram, side to side.....	"	11 $\frac{1}{2}$
Top platen to ram, when down.....	"	31 $\frac{1}{2}$
Opening between rods at front.....	"	11 $\frac{3}{4}$
Opening between rods at side.....	"	5 $\frac{1}{4}$
Bench space.....	"	22 by 31
Diameter of pump plunger.....	"	$\frac{3}{8}$
Maximum stroke of pump.....	"	3
Weight of pump and valve.....	pounds	40
Weight of press and pump.....	"	850
Price of press and pump.....	\$	.....
Price of pressure gauge, extra.....	\$	.....

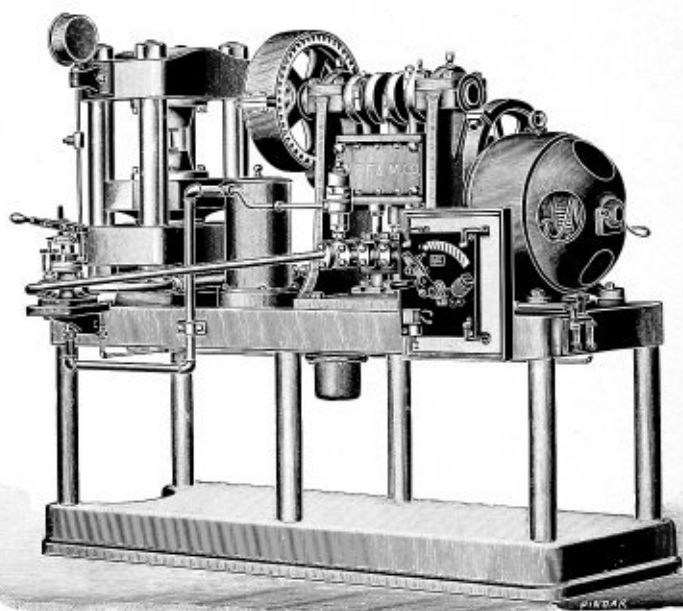


20 Ton Hydraulic Press (1414)

For cooling under pressure buttons, eyelets and similar small articles covered with enamel or like compositions we have small presses fitted for cold water circulation in the platens. The cylinder and bottom platen are cast together. The presses are generally made in pairs, each pair being accompanied by a steam plate. The pump and accumulators used with these presses are listed on page 114 H, No. 1178 accumulator, (page 101 H) and No. 2609 pump, page 123 H ($\frac{3}{8}$ inch plungers), being suitable for a battery of a dozen 20 ton presses. We should be pleased to quote on larger sizes of these presses to suit special requirements.

SPECIFICATIONS.

Number of Machine	1414	2000	3501
Capacity..... tons	20	40	60
Working pressure..... lbs. per sq. in.	2050	2100	2390
Diameter of ram..... inches	5	7	8
Maximum stroke..... "	2	2	2
Top of ram, front to back..... "	12	12	14
Top of ram, side to side..... "	11 $\frac{1}{2}$	11 $\frac{1}{2}$	12 $\frac{1}{2}$
Top platen to ram, when down... "	2 $\frac{1}{4}$	2 $\frac{1}{4}$	10 $\frac{1}{2}$
Opening between rods at front... "	11 $\frac{3}{4}$	11 $\frac{3}{4}$	12 $\frac{3}{4}$
Opening between rods at side..... "	6 $\frac{3}{4}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$
Space occupied on bench..... "	17 by 12	18 $\frac{1}{2}$ by 12	21 by 14
Extreme height..... "	17 $\frac{3}{4}$	21 $\frac{1}{4}$	33
Weight..... pounds	540	810	1450
Price..... \$	.....	.....	.....



60 Ton Hydraulic Press (3022) and 1 3-16 by 3 Inch by 2400
Pound Geared Triplex Pump (3023), with Direct
Connected Motor.

Bypass Valve Patented July 30, 1895.

See description on next page.

60 Ton Hydraulic Press (3160)

Is combined with pump No. 3023 and motor as shown in photo 1181 to form a more compact tool than that shown above. The motor and tank are placed on the base and the machine is thus shortened appreciably. The drive from motor to pump is by a Renold Silent Chain. All specifications given opposite apply to this machine except these: floor to top of ram when down, 48½ inches; floor space, 58 by 52 inches; motor, General Electric, 1060 R. P. M.

Weight including motor, 5600 pounds. Price, \$.....

60 Ton Hydraulic Press (3022) and 1 3-16 by 3 Inch by
2400 Pound Geared Triplex Pump (3023)
Direct Connected Motor.

This apparatus was designed and built especially for the assay department at the United States Mint at Philadelphia. The dies shown are hardened flat discs for **flattening test pieces**. It is however suitable for any work up to its capacity. The piping, tank and ram are brass, and the press cylinder is copper lined. All packing not metallic is leather, to allow of **using oil** in the system. A gauge and safety valve are furnished. The control valve is our patent bypass valve, which allows the operator to stop the ram at any part of its upward motion by hand or automatically when a predetermined pressure is reached. Rawhide pinions are used throughout. Wiring, starter and switch are included. See also photo 1083.

PRESS.

Capacity of press.....	tons	60
Working pressure.....	lbs. per sq. in.	2300
Diameter of ram.....	inches	8
Maximum stroke.....	"	2
Top of ram, front to back.....	"	14
Top of ram, side to side.....	"	12 $\frac{1}{2}$
Top platen to ram, when down.....	"	10 $\frac{1}{2}$
Floor to top of ram, when down.....	"	48
Opening between rods at front.....	"	12 $\frac{3}{4}$
Opening between rods at side.....	"	5 $\frac{3}{4}$
Speed of ram.....	ins. per min.	10

PUMP.

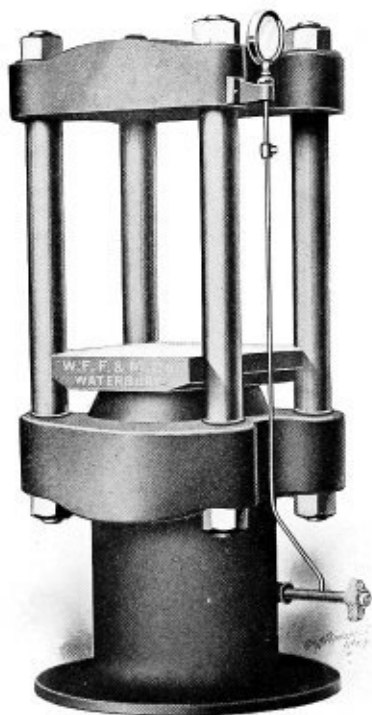
Number of plungers.....		3
Diameter of plungers.....	inches	1 $\frac{3}{16}$
Stroke of plungers.....	"	3
Working pressure.....	lbs. per sq. in.	2400
Revolutions per minute of crankshaft.....		60
Capacity.....	cu. ins. per min.	565
Size of discharge pipe.....	inches	$\frac{3}{4}$ xx

MOTOR.

Size, direct current (Crocker-Wheeler).....	horse power	5
Voltage.....		220
Revolutions per minute.....		980

IN GENERAL.

Floor space.....	inches	81 by 52
Weight including motor.....	pounds	6710
Price including motor.....	\$	.....



80 Ton Hydraulic Press (3578)

For specification see next page.

The press shown in the cut above was designed for use with an accumulator system and two screw stem stop valves are furnished with it, the hand wheels operating them being located one either side of the press, about as high as the top of the ram. All parts of this press are cast iron except the tie rods which are steel; the ram is packed with leather on its end; the crosshead is not guided on the tie rods.

80 Ton Hydraulic Press (3578)

Illustrated and described opposite.

SPECIFICATIONS.

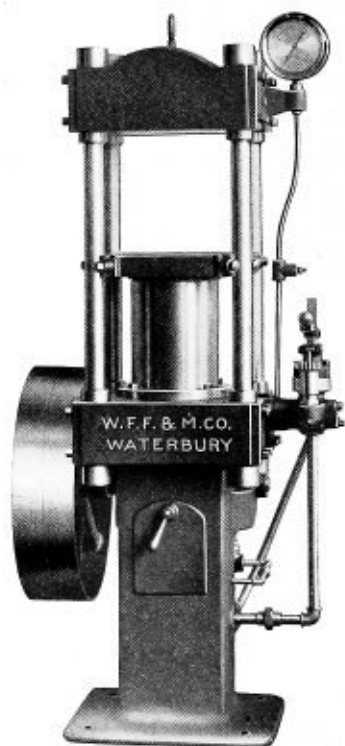
Capacity of press.....	tons	80
Working pressure.....	lbs. per sq. in.	1410
Diameter of ram.....	inches	12
Maximum stroke.....	"	15
Top of ram, front to back.....	"	20
Top of ram, side to side.....	"	24
Top platen to top of crosshead, when down.....	"	25
Floor line to top of crosshead, when down.....	"	36
Opening between rods at front.....	"	20
Opening between rods at side.....	"	11
Extreme height.....	"	71
Floor space, f. to b. by s. to s.....	"	32 by 50
Size of pipe.....	"	1xx
Weight.....	pounds	5135
Price with valve and gauge.....	\$	.....



80 Ton Two Rod Hydraulic Press (3066 A)

This press is shown on photo 1118. It has the cylinder and lower platen combined in a single iron casting, the ram and crosshead are also in one piece and it is cast iron, as are also the guides, nuts and top platen. The tie rods are forgings passing through holes in cylinder and top platen and they are fastened in place by nuts. The ram is packed by leather held in a recess in the cylinder. Capacity, 80 tons; working pressure, 2820 pounds per square inch; ram, $8\frac{1}{2}$ inches diameter, 10 inches stroke; top of ram, front to back, 16 inches, side to side, $18\frac{1}{2}$ inches; between rods, 21 inches; top platen to ram when down, $38\frac{3}{4}$ inches; under side of top platen, 16 inches front to back, $18\frac{1}{2}$ inches side to side; floor space, 30 by 41 inches; height, 78 inches; size of inlet pipe, $\frac{1}{2}$ xx. Price below includes gauge and automatic bypass valve, but does not include any tools or knockout.

Weight, 3400 pounds. Price, \$.....



70 Ton Portable Hydraulic Press (895)

Bypass Valve Patented July 30, 1895.

The illustration shows the front of a hydraulic press with pump, valve, water tank, safety valve and pressure gauge complete. This forms a **compact and self-contained** portable press for all kinds of small work. The cylinder is of steel, copper lined, and rests on the bottom platen as in the standard presses on page 5 H. The total pressure exerted on the work is regulated by adjusting the automatic valve (No. 895 A, page 141 H) to trip when the desired pressure is reached, the ram then falling at once, ready for the next stroke. For dimensions, etc., see the table on the next page.

70 Ton Portable Hydraulic Press (2767)

Is press 895 shown opposite with a larger pump replacing the pump there shown. This change gives a faster speed to the press ram and is shown on photo 854. The sizes and speeds are as given in the table below.



70 Ton Portable Hydraulic Press (3456)

This machine is similar in general design to the one in the cut on the opposite page; the chief difference is in the cylinder which is cast iron and in one piece with the lower platen; it is not copper lined. The crosshead is fitted with steam circulation and there is a filler attached to the upper platen which reduces the vertical space for tools from 14 to 3½ inches. The valve acts as described opposite. See photos 1395 and 1396.



70 Ton Presses.

Number of Machine	895	3456	2767
Capacity..... tons	70	70	70
Pressure..... lbs. per sq. in.	4960	2100	4960
Diameter of ram..... inches	6	9¼	6
Maximum stroke..... "	8	3	8
Top of ram, front to back..... "	11⅝	16	11⅝
Top of ram, side to side..... "	13¾	14	13¾
Top platen to ram when down..... "	12	14	12
Opening between rods at front..... "	12¼	15	12¼
Opening between rods at side..... "	8¼	7	8¼
Floor space..... "	34 by 32	44 by 44	34 by 38
Extreme height..... "	69	79	69
Diameter of pump plungers..... "	¾	1⅞	1
Stroke of pump plungers..... "	2½	4	4
Number of plungers.....	3	3	3
Speed of driving pulley..... R. P. M.	135	290	245
Diameter of pulley..... inches	24	30	30
Face of pulley..... "	3	5¼	5¼
In 1 min. pump moves press ram.. "	8	23	18
Weight complete..... pounds	1850	5070	2700
Price with valve and pump..... \$	.....	.....	.....

40 Ton Four Rod Hydraulic Press (3542) with Hand Pump (3067)

This machine has an **unusually high tool space** and as it has its own tank and gauge it is self contained and independent of any source of power. In general appearance the press resembles No. 3578, page 40 H; the pump is mounted on the right hand side of the lower platen as shown on page 36 H; the cylinder is copper lined; the lower platen, upper platen and ram are cast iron; tie rods are machine steel; the crosshead is cast iron and is not guided on the rods; the tank is cast iron and is bolted to the rear of the press.

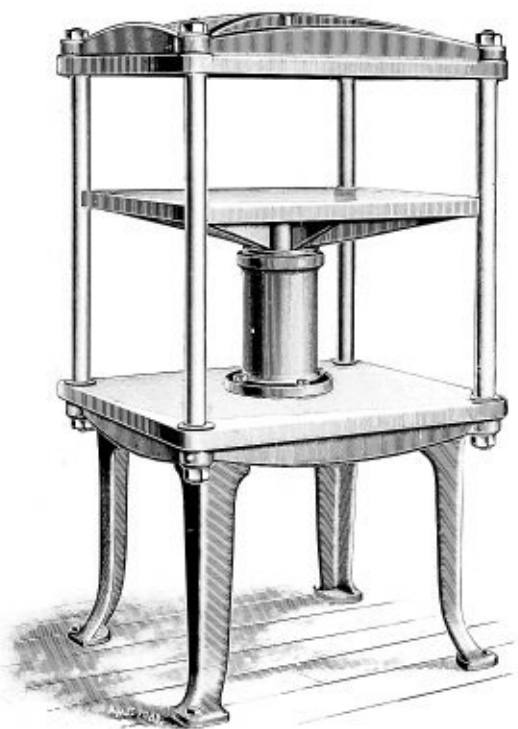
SPECIFICATIONS.

Capacity.....	tons	40
Working pressure.....	lbs. per sq. in.	1600
Diameter of ram	inches	8
Maximum stroke.....	"	8
Top of ram, front to back.....	"	12
Top of ram, side to side.....	"	18 $\frac{7}{8}$
Top platen to top of crosshead when down.....	"	33
Opening between rods at front.....	"	16
Opening between rods at side.....	"	9 $\frac{1}{8}$
Floor space, f. to b. by s. to s.....	"	41 by 31
Extreme height.....	"	70
Weight.....	pounds	2650
Price, including pump, tank and gauge.....	\$	.....

18 Ton Four Rod Hydraulic Press (3274)

Is used for pressing studs into a previously drilled casting. The press stands on a pedestal and has the lower platen bored out to receive the 5 $\frac{1}{2}$ -inch ram; the crosshead is guided on the four steel rods and has the ram cast solid on it; the top platen is ribbed. There is no gauge with the press; two screw stem stop valves are furnished and the press is designed to receive its water from an accumulator system. The ram is leather packed on its end. Capacity, 18 tons; working pressure, 1520 pounds per square inch; stroke, 6 inches; top of crosshead, 15 inches square; top platen to crosshead when down, 18 inches; floor to top of crosshead, 39 $\frac{1}{2}$ inches; floor space, 27 by 24 inches.

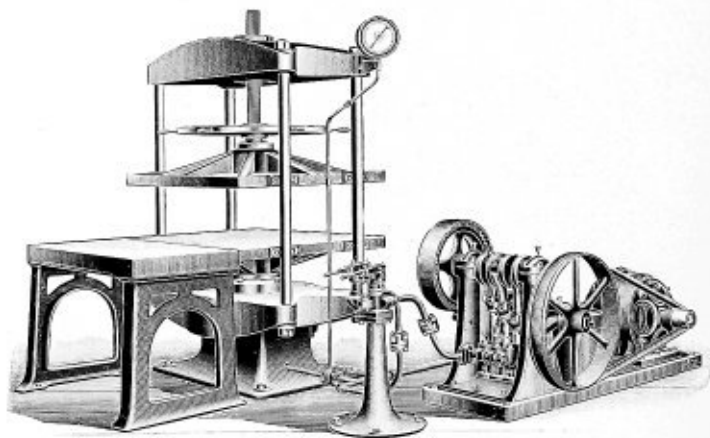
Weight, 1150 pounds. Price, \$



6 Ton Portable Hydraulic Press (1043)

Designed for pressing paper, felt or fabrics of any kind where a light pressure quickly applied is desired. The press can be attached to city mains, an accumulator system or a small pump. Capacity, 6 tons; working pressure, 450 pounds per square inch; diameter of ram, $5\frac{5}{8}$ inches; maximum stroke, 9 inches; top of ram, front to back, 26 inches, side to side, 32 inches; top platen to ram when down, 12 inches; opening between rods at front, 30 inches, at side, 24 inches; floor space, 36 by 30 inches; extreme height, 65 inches. Suitable valves or pumps will be furnished with this press at a small extra cost.

Weight, 2020 pounds. Price, \$.....



30 Ton Screw Hydraulic Press (2668) and Geared Triplex
Power Pump (2669)

Bypass Valve Patented July 30, 1895.

The combination of these two machines results in a self contained plant for **making large packing rings**, and it will be found useful in other capacities as well. The table shown in front of the press is separate from it and can be moved away if desired. The use of electricity if available for transmitting power to the pump makes it possible to locate the plant without reference to existing lines of shafting and affords a convenient way of economizing power while the packing rings are setting.

30 Ton Screw Hydraulic Press (2668)

WITH CHECK CONTROL VALVE.

The upper or stationary platen is adjustable up and down by means of the screw and handwheel shown. The ram is of cast iron packed on the end and works in a cast iron cylinder, copper lined. The platens and top frame are of cast iron, the adjusting screw and tie rods of steel. The valves are designed so that the power exerted by the press increases until it reaches a predetermined limit, then the supply is bypassed and a check valve holds the ram (still under pressure) against the work until the packing has set, when the pressure is released by hand. Capacity of the press, 30 tons; working pressure, 1200 pounds per square inch; ram, 8 inches diameter, 18 inches maximum stroke; both platens, 48 inches square; bottom platen down to upper platen up, 24 inches; adjustment down of upper platen, 16 inches; opening between rods at front, $51\frac{1}{2}$ inches, at side, $21\frac{1}{4}$ inches; floor space without valve, 66 by 80 inches; extreme height, 106 inches; floor to top of table, 36 inches; top of table, 48 by 28 inches. The price given below includes press, valves and table.

Weight, 12010 pounds. Price, \$.....



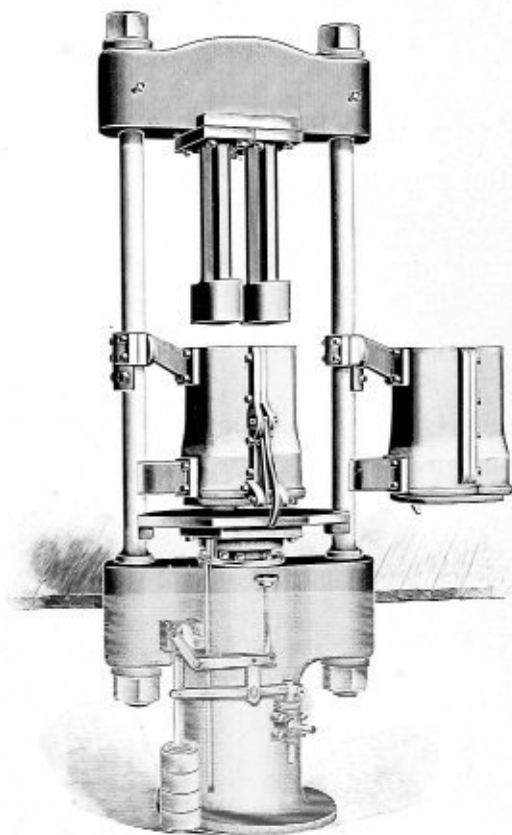
1 $\frac{1}{8}$ by 4 inch Geared Triplex Power Pump (2669)

ELECTRICALLY DRIVEN

The illustration shows our pump No. 1668 A, page 120 H, mounted with a tank and motor on a base plate. The motor is $7\frac{1}{2}$ horse power, direct current, 230 volt General Electric; the pump has three plungers, each $1\frac{1}{8}$ inches diameter, 4 inches stroke and will throw 2015 cubic inches of water per minute against 1400 pounds per square inch pressure; ratio of gearing, 4 1-12 to 1; pulley, 30 by $4\frac{1}{2}$ inches, 245 revolutions per minute; discharge pipe, 1 inch double extra; floor space, 86 by 32 inches.

Weight without motor, 2360 pounds. Price, \$.....

Weight of motor, extra, 540 pounds. Price, \$.....



Hydraulic Cabbaging Press (1668)

Hydraulic Cabbaging Press (1668)

This machine is designed for compressing loose sheet metal scrap into convenient form for handling and remelting in crucibles. It is a two rod, upright hydraulic press with two pots for receiving the scrap and holding it during the operation, combined with suitable controlling devices.

The operation is as follows: The false bottom of the pair of moulds shown extended outward at the right is closed and the moulds filled with scrap, which is packed tightly by hand. The other, shown between the upright rods, is swung out to the left to be emptied and the filled moulds swung in. By stepping on the foot plate near the floor at the center of the press, the control valve is closed and the ram begins to rise. The moulds are carried up over the plungers attached to the top platen and the scrap is compressed to the required thickness, the press stopping automatically and the ram falling. The moulds are swung out and the false bottom lowered so that the compressed scrap or "cabbage" may be pounded out with an iron bar. The operation is repeated, one set of moulds being filled while the other is being compressed.

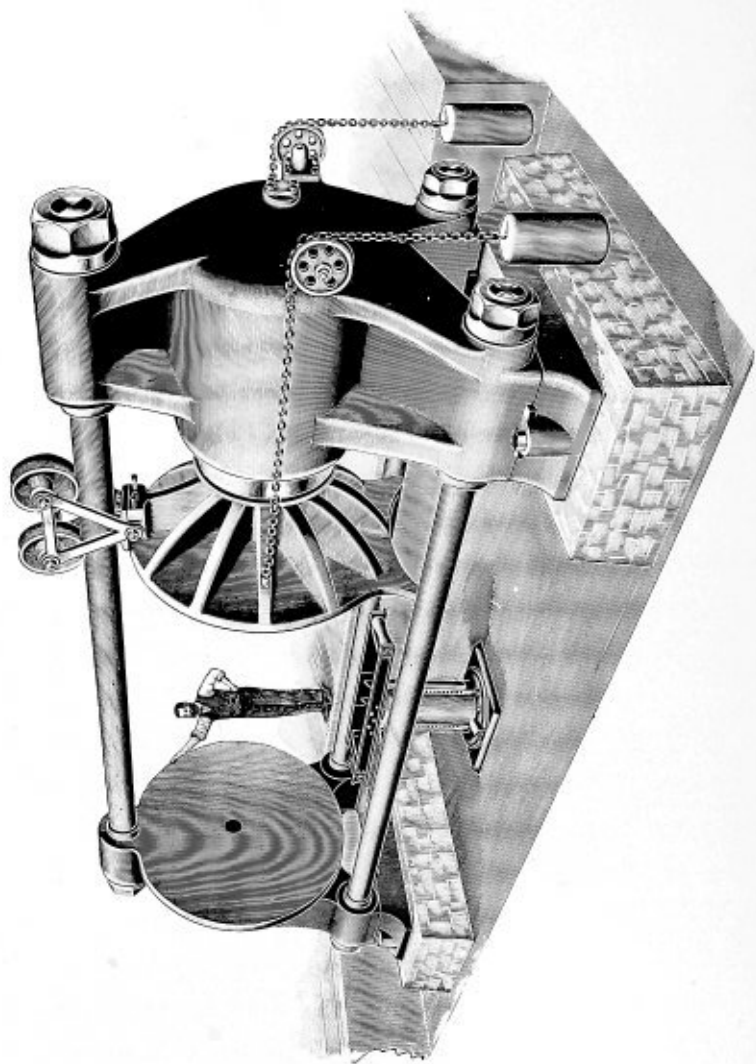
The press has two rods and its base and cylinder are cast together. It should be set on a foundation so that the top of the base comes about 6 inches above the floor, the operating valves and piping coming in a pit underneath. The swinging moulds are made double, each pot having two openings $5\frac{1}{2}$ by 12 inches and 24 inches deep. The finished cabbage is $5\frac{1}{2}$ by $5\frac{1}{2}$ by 12 inches and weighs from 25 to 40 pounds according to the nature of the scrap used. There are two styles of moulds in use, one of which has a sheet steel slide for its false bottom, the other a cast iron swinging bottom (moulded to fit end of plunger) which is opened and closed by a lever and toggle. The water pressure required to form the cabbage is from 800 to 1200 pounds per square inch and a power pump (No. 1668 A, page 120 H) with capacity for driving ram about 2 feet per minute is recommended, although it may be driven from a steam pump or accumulator if they are available. Capacity of press, 45 tons; working pressure, 1200 pounds per square inch; ram, $9\frac{3}{4}$ inches diameter; stroke, 24 inches; top of ram, $18\frac{1}{2}$ inches wide; top platen to ram when down, 60 inches; opening between rods, 32 inches; floor space, 46 by 30 inches, extreme height, 128 inches.

Weight of press, 9380 pounds. Price, \$.....

Weight of press and pump No. 1668 A, 10870 pounds. Price, \$.....



If two presses are operated by one pump, a modification of the controlling mechanism locates the valves on the pump itself, connected with the trip on the press by wire rope or chain. Pump No. 1713 (page 124 H) can be used to run two presses.



60 Inch Horizontal Pipe Tester (2428)

Horizontal Pipe Testers.

	Number of Machine	2428	1366
Maximum diameter of pipe machine will test.....		60	30
Longest pipe machine will test, over all.....		151	148
Maximum test pressure on largest pipe..... lbs. per sq. in.		350	350
Diameter of stationary platen..... inches		84	47
Diameter of traveling platen.....		74	40
Diameter of ram.....		36	20
Stroke of ram.....		19	16
Center line to the bottom of upper tie rod.....		40 ³ / ₄	22 ¹ / ₄
Center line to level of top of lower rods.....		40 ¹ / ₄	21 ⁷ / ₈
Distance between lower rods, clear.....		52 ¹ / ₂	35 ⁵ / ₈
Maximum distance between platens.....		171	164
Pressure on ram..... lbs. per sq. in.		1600	1200
Size of pipe to stationary head.....		6x	6x
Size of pipe to cylinder head.....		3xxx	2x
Overall dimensions of machine..... feet		26 by 7	18 ¹ / ₂ by 5 ¹ / ₂
Extreme height of machine.....		13	6 ¹ / ₂
Height of machine above floor.....		8 ⁴ / ₈	6 ¹ / ₂
Weight, without lift..... pounds		96400	28200
Price, without lift..... \$			

60 Inch Pipe Tester (2428)

This press, illustrated on page 50 H, is used to test cast iron water pipes for bursting. It consists of a stationary head connected by three horizontal tie rods to a cylinder head which contains a ram that is used to move the traveling head shown suspended from the rollers on the upper tie rod. The heads and base plates are of cast iron, the tie rods forged steel, with nuts made from steel castings. The ram is rubber packed.

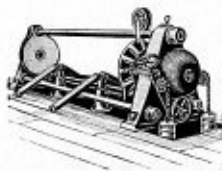
The operation of testing a pipe is as follows: The pipe is run out from the floor on skids over the pit until it is in the middle of the machine. The lift, described below, is started up and the cradle on its top lifts the pipe off from the skids and centers it in the press. The traveling head is moved forward against the end of the pipe and the force exerted by the ram seals both ends of the pipe by pressing it against suitable gaskets held on the heads. Water is run into the pipe from a tank and when full the test pressure is applied from an accumulator. After the test the pressure on the ram is released and the counterweights draw the traveling head back, the water in the pipe falling into the pit. The lift is lowered and the pipe set on the skids and rolled away.

The lift (Photo 670) is of 12½ tons capacity and is operated by water under a pressure of 125 pounds per square inch. The ram is 16 inches diameter, 23 inches stroke. Supply pipe, 2 inch common. It has sufficient range so that 24 inch pipe can be centered in the press by its use. Weight of lift, 3670 pounds. Price, \$

The skids and gaskets used are not furnished by us, nor do we include operating valves. The accumulators used for the cylinder supply are those mentioned on page 104 H as having weights held on by removable pins. For the smaller sizes of pipe the pressure should be decreased by detaching several weights.



30 Inch Pipe Tester (1366)



This press resembles the larger machine described above. As the small cut shows it is of the same general design except that the lift is operated by hand power. By turning the wheel shown near the cylinder head, the power jacks shown can be made to lift a small pipe and center it. As small as 12 inch pipe may be tested in this press. The gaskets and valves are not included with it.

Pipe Testing Plants.

The following table gives weights and prices of the various machines included in pipe testing plants operated as described on the opposite page. The general layout of such a plant depends so much on individual conditions that we give an approximate price (subject to revision) on the piping and valves necessary. The pumps and accumulators are furnished mounted together.

Size of Machine	60 Inch		30 Inch	
a. Pipe Tester..... No.	2428	page 52	1366	page 52
b. Accumulator for cylinder.... "	2430	" 105	1366A	" 105
c. Pump for cylinder..... "	1668A	" 121	3023	" 122
d. Accumulator for testing..... "	2429	" 98	1366B	" 98
e. Pump for testing..... "	2609	" 123	2609	" 123
Weight and price of a..... lbs.	96400	\$	28200	\$
" " " " b..... "	24280	.....	6250	.....
" " " " c..... "	2200	.....	1700	.....
" " " " d..... "	8130	.....	2800	.....
" " " " e..... "	1130	.....	1130	.....
Approximate price of valves and piping.		.....	—	.....

Bulkhead Pipe Tester.

This was made for the purpose of applying test pressures to a pipe line under construction. It is for 36 inch pipe and 300 pounds per square inch pressure. There is a false end which fits the bell end of the last pipe laid, the joint between being rubber packed. In this false end moves a ram 38 inches in diameter, which rests against a temporary bulkhead built across the excavation for the pipe. When water is let into the pipe line from above and the test pressure applied, the thrust of the ram, however much the bulkhead may yield, will keep the rubber packing tight. Stroke of ram about 16 inches.

Weight, 3125 pounds. Price, \$.....

We will be pleased to answer inquiries in regard to pipe testers of other sizes than those listed and to recommend accumulators and pumps for use with them. Prices on complete plants including the necessary valves and piping will be furnished on application.



4 Inch by 16 Foot Hydraulic Tube Tester (2985)

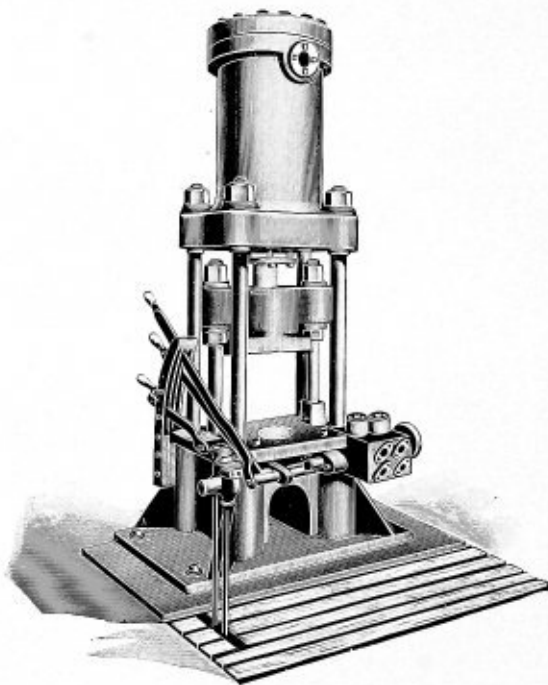
CAPACITY 1000 POUNDS PER SQUARE INCH

Hydraulic Tube Testers.

These machines are used for testing for bursting, brass, copper or other metal tubes, with an hydraulic pressure of 1000 pounds per square inch or less. The tube to be tested is placed in V ways by the operators—one of whom stands near the cylinder head on the left hand, the other at the moveable head on the right—between the flanges on the ends of these heads. To these flanges are attached by clamps sheet rubber gaskets, between which the ends of the tubes are sealed by screwing up to one end of the tube a sliding piece in the moveable head and thus making the ends tight. As soon as this is done, a valve in the moveable crosshead is opened to allow the air to leave the tube as it is filled with water coming through the large valve operated by the foot treadle. As soon as the tube is filled the air valve and the large valve are closed, and the test pressure applied by the hand valve on the stationary head. The pressure is let off by opening the air valve. The sliding piece is then screwed back, unsealing the tube and allowing the water to fall from it into the bed. A wooden trough (not shown in the illustration) is under the bed, slightly inclined toward the left hand end of the machine. The water runs from the bed to the trough, from which it may run to a sewer, or a cistern and be pumped to an overhead tank and used again for filling tubes. The moveable head is adjusted to any position on the bed, and is held in place by pins, which go through holes in the side bars. Tubes of any size smaller in diameter than the maximum size given in the table below, down to $\frac{1}{2}$ inch, may be tested. Our patterns are made in such a way that machines may be made of any length up, from the shortest with a maximum capacity of a tube six feet long, varying by five feet. Valves, V ways and a gasket clamp plate for the maximum size tube, and a wooden trough with the pipes running from the bed to it, are furnished with the machine. Other sizes of clamp plates extra. The test pressure is generally applied from an accumulator, upon which we are prepared to quote.

SPECIFICATIONS			4 Inch Machine 2985	9 Inch Machine 2984		
Outside diameter of largest tube which can be tested.....	inches		4 $\frac{1}{2}$	9		
Size of pressure supply pipe.....	"		$\frac{3}{4}$ x	$\frac{3}{4}$ x		
Size of filling supply pipe.....	"		2 Com.	2 $\frac{1}{2}$ Com.		
Center to center of holes in side bars.....	"		1 $\frac{3}{4}$	2		
Width over all.....	"		22	22		
Tester for Tubes of Length Given Below and Shorter	Length Over all—Feet		Weight—Pounds		Price—Dollars	
	4 Inch 2985	9 Inch 2984	4 Inch 2985	9 Inch 2984	4 Inch 2985	9 Inch 2984
6 feet.....	12 $\frac{2}{3}$	13 $\frac{1}{4}$	3500	4550		
11 ".....	17 $\frac{2}{3}$	18 $\frac{1}{4}$	4340	5400		
16 ".....	22 $\frac{2}{3}$	23 $\frac{1}{4}$	5300	6200		
21 ".....	27 $\frac{2}{3}$	28 $\frac{1}{4}$	6000	7050		
26 ".....	32 $\frac{2}{3}$	33 $\frac{1}{4}$	6850	7900		
31 ".....	37 $\frac{2}{3}$	38 $\frac{1}{4}$	7650	8700		
36 ".....	*42 $\frac{2}{3}$	43 $\frac{1}{4}$	8500	9550		

*Photo 1062.



Double Acting Vertical Drawing Press (1037)

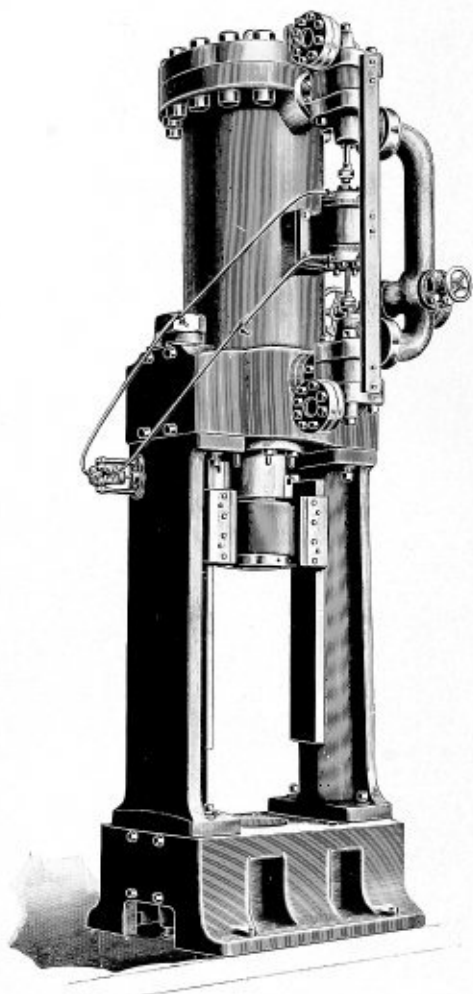
In cupping blanks from flat circular sheets, the buckling of the blank can be prevented by the use of a holder. This presses on the blank sufficiently to keep it flat while it is being drawn in toward the center of the die. The press is of the vertical class with four supporting rods and having an auxiliary hydraulic cylinder operating the blank holder through toggles. The main cylinder is of cast iron, the upper head bolted to it and the lower head screwed in.

Double Acting Vertical Drawing Presses.

The piston is packed by rubber rings held in place by suitable plates. On the lower end of the piston rod the punch is held. The base is cast iron and rests on a foundation, the die being bolted to the top of the base, and the cups, after passing through the die, fall out on to the floor through a hole in the base. The **auxiliary cylinder** is bolted to a frame attached to the under side of the base, the end of its piston rod being connected to a pair of toggles, one end of which is held in the base and the other linked to the upright rods attached to the blank holder and shown in the cut between the supporting rods on the sides of the press. The press is controlled by valves actuated by the three handles shown at the left. One regulates the action of the blank holder, another starts and stops and the third reverses the main piston. The presses are driven from an accumulator system.

SPECIFICATIONS.

Number of Machine	1037	1037A
Diameter of piston..... inches	12	16
Length of stroke..... "	20	20
Capacity, pushing..... tons	56½	100½
Working pressure..... lbs. per sq. in.	1000	1000
Diameter of piston rod..... inches	6	6
From floor to top of bed..... "	20	20
Top of bed to blank holder up..... "	17	17
Top of bed to ram when down..... "	17½	17½
Stroke of blank holder..... "	4¾	8½
Diameter auxiliary piston..... "	6	6
Top of base front to back..... "	24	24
Distance between uprights at bed..... "	21	21
Diameter hole through bed..... "	12	12
Floor space..... "	54 by 32	54 by 32
Size of supply pipe..... "	2x	2x
Extreme height..... inches	106¾	106¾
Weight..... pounds	9560	10300
Price..... \$	.....	.....



22 by 47 $\frac{1}{4}$ Inch Vertical Hydraulic Drawing Press (2249)
ACCUMULATOR DRIVEN. WITH AUTOMATIC REVERSING VALVES.

22 by 47 $\frac{1}{4}$ Inch Vertical Hydraulic Drawing Press (2249)

**ACCUMULATOR DRIVEN,
WITH AUTOMATIC REVERSING VALVES.**

The press shown in the cut on the opposite page is similar to the horizontal presses described on page 62 H. It is used to make large shallow cups from flat circular blanks and also for the first drawing operations on cartridge cases. The die holder is bolted to the top of the bottom platen and the blank is pushed through the die and base into a recess in the foundation. The handle for operating the pilot valve by hand is on the front of the press and hidden from view by the upright rail. This press is fitted with the same automatic controlling devices that the horizontal presses have.



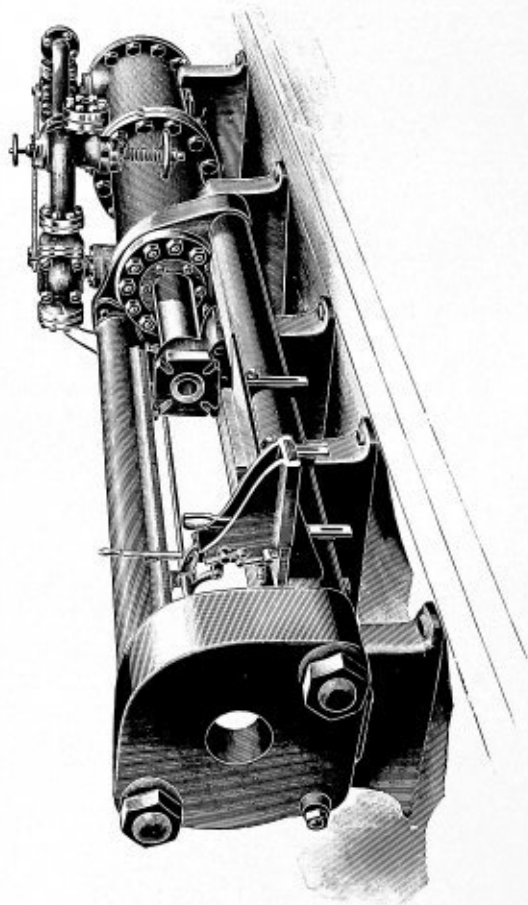
22 by 50 Inch Vertical Hydraulic Drawing Press (2696)

**DIRECT DRIVEN,
WITH AUTOMATIC REVERSING VALVES.**

This press is of a design similar to the one shown on the opposite page. It is shown in photo 864. The chief distinctions between the two are that this one is directly driven by a steam pump (a power pump could be used instead if desired) and no accumulator is used. The automatic reversal described on page 63 H is included and an additional feature is that this press can be stopped automatically at the top end of each stroke if desired. The pump and accumulator shown on page 107 H are used to furnish the power for the automatic valves. This press is designed to stand on a foundation coming up through the floor far enough to allow the cups to slide down a chute onto the floor. The price and weight below include piping and tank.

SPECIFICATIONS.

Number of Machine	2249	2696
Diameter of piston..... inches	22	22
Length of stroke..... "	47 $\frac{1}{4}$	50
Capacity, pushing..... tons	190	190
Working pressure..... lbs. per sq. in.	1000	1000
Diameter of piston rod..... inches	14	11
From floor to top of base..... "	24	42
From top of foundation to top of base... "	24	24
Top of base to ram when down..... "	16	10
Top of base, front to back..... "	34	34
Distance between uprights at base..... "	32 $\frac{1}{2}$	32 $\frac{1}{2}$
Diameter hole through bed..... "	16	11 $\frac{1}{2}$
Floor space..... "	62 by 48	70 by 73
Size of supply pipe.....	4xx	4xx
Extreme height..... inches	198 $\frac{1}{4}$	219
Weight..... pounds	42660	43500
Price..... \$	.....	.....



18 Inch by 10 Foot Horizontal Hydraulic Drawing Press (2250)
ACCUMULATOR DRIVEN. WITH AUTOMATIC REVERSING VALVES.

Horizontal Hydraulic Drawing Presses.

ACCUMULATOR DRIVEN.

WITH AUTOMATIC REVERSING VALVES.

	Number of Machine	2250	2251	2253
Diameter of piston.....	inches	18	16	12
Length of stroke.....	feet	10	10	8
Capacity, pushing.....	tons	127	100½	56½
Capacity, pulling.....	"	95	75	42
Working pressure.....	lbs. per sq. in.	1000	1000	1000
Diameter of piston rod.....	inches	9	8	6
From floor to center of die head.....	"	30	30	30
From rails to center of die head.....	"	8	8	7
Diameter hole through die head.....	"	10	10	8
Greatest width.....	"	57½	57½	56½
Length over all.....	feet and inches	28—4¼	28—3½	23—9¼
Size of supply pipe.....	inches	4XX	4XX	3XX
Weight.....	pounds	40470	37870	24110
Price.....	\$			

Hydraulic Drawing Presses.

ACCUMULATOR DRIVEN. WITH AUTOMATIC REVERSING VALVES.

These machines, illustrated on pages 58 H and 60 H, are used in the manufacture of **cartridge cases**—as large as 6 inches in diameter—or for drawing large short tubes of similar dimensions. With the valves properly adjusted, the piston makes its stroke and returns automatically, the attendants merely feeding the material to the press and removing the finished work.

The horizontal presses, of which No. 2250 (illustrated on page 80 H) is a type, are two rod machines, the rods passing through castings which serve as columns to separate the die head and cylinder. The die head is of cast iron, with a large cast iron die nut. The end of the piston rod, which holds the punch, is supported and rigidly guided by a crosshead sliding on the bed. Suitable **adjustments for taking up wear** are provided. The cylinders are of cast iron, both heads being bolted to it, the joints between them lead packed. The piston has square flax packing with suitable provision for repacking and tightening. Square flax packing is used also for packing the piston rod in the front head. Sizes and dimensions of these presses are given in the table on page 61 H.

The **operation** of a horizontal machine is as follows: The cases to be drawn are placed on the wooden table and pushed, one by one, into the feed slide shown just back of the die head. Upon entering the feed slide each case is gripped by wooden jaws operated by turning a handle, the feed slide then being moved over central with the die. The punch, held in the end of the piston rod, comes up and pushes the case through the die. The valves reverse the ram and the case is stripped from the punch by the die. While one case is being drawn, the next is placed in the feed slide.

The **action of the automatic valves** is as follows: On the upper rail are mounted dogs which are connected by shafts to a small pilot valve. When a pin, carried by the crosshead, moves one of these dogs, the accumulator pressure is admitted to one end of a cylinder carried on top of the main cylinder. The piston of this small cylinder is attached directly to the reversing valves, one of which is located on each end of the main cylinder, and its motion throws both, resulting in the reversal of the main piston. The operator has within reach a handle whereby he can reverse the bench at will. The dogs can be set so that the stroke can be varied in length or relative position as desired. There is a throttle valve, shown in the illustration, which acts also as an alleviator and serves to regulate the speed of the bench. There should be a stop valve—not furnished with the press—placed in the piping leading from the pipe line and this should be used to stop the press. We furnish anchor plates and bolts, also suitable foundation plans.

The illustration on page 60 H shows the 18 inch press (No. 2250); it is also shown in photo 484. The 16 inch (No. 2251) has the same stroke as the 18 inch and is also used in drawing operations. The 12 inch (No. 2253) has a shorter stroke and has but one length of cylinder, otherwise resembling the 18 inch. It is used in cartridge manufacture for the tapering operations. With the 22 inch upright press (No. 2249, page 58 H), these presses constitute all the drawing presses needed in the manufacture of large cartridge cases. All are designed for use with an accumulator system. For a **cartridge plant** with one of each of the four presses, we would recommend one accumulator, No. 1722 (page 100 H). The size and speed of pumps, whether steam or power pumps, to be used with the system will depend on the desired daily output of the presses, and we invite correspondence regarding the piping and pumps for use with any proposed plant of this general character.



12 Inch by 8 Foot Horizontal Hydraulic Drawing Press (2695)

DIRECT DRIVEN.

WITH AUTOMATIC REVERSING VALVES.

Horizontal Drawing Presses

DIRECT DRIVEN.

WITH AUTOMATIC REVERSING VALVES.



12 Inch by 8 Foot Hydraulic Drawing Press (2695)

This is our No. 2253, page 61 H, fitted for tapering rapid fire cartridge cases. It can be used also for drawing them. The machine as here illustrated has a knockout for use with the tapering attachment, a tube support and the automatic reversal described on page 63 H, and in addition it can be stopped back automatically each stroke if desired, or the ram can be stopped at any time at the will of the operator. It is designed to be direct driven from a power pump, and the weight and price given below include piping and a tank for a layout where the pump and press are located close together. Diameter of piston, 12 inches; length of stroke, 8 feet; capacity, pushing, $56\frac{1}{2}$ tons, pulling, 42 tons; working pressure, 1000 pounds per square inch; piston rod, 6 inches diameter; from floor to center of die head, 30 inches; from rails to center of die head, 7 inches; hole through die head, $11\frac{1}{2}$ inches diameter; floor space, 305 by 40 inches; size of supply pipe, 3 inch double extra.

Weight, 29070 pounds. Price, \$.....



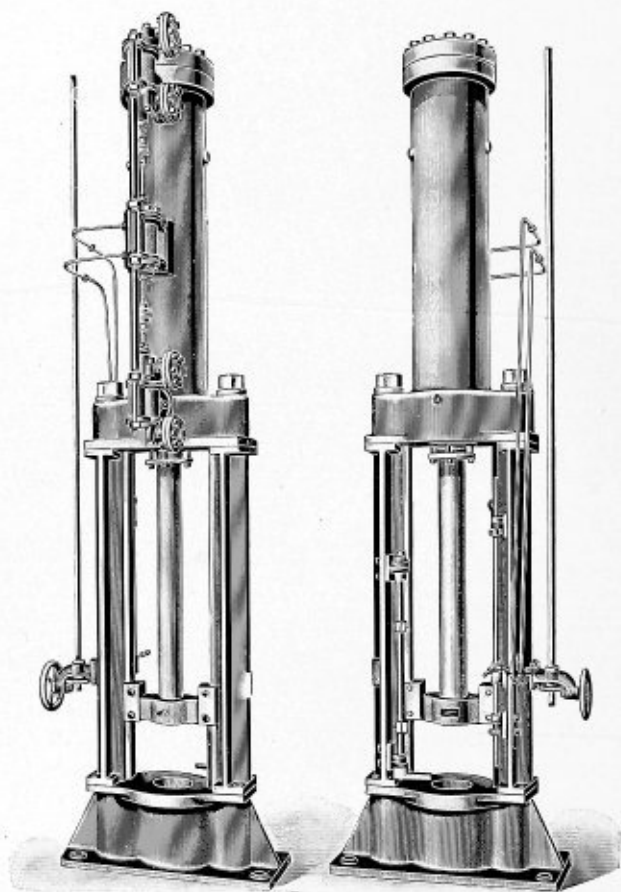
18 Inch by 10 Foot Hydraulic Drawing Press (2694)

Is used for drawing only, otherwise is similar to No. 2695, described above. It is shown on photo 860. Diameter of piston, 18 inches; length of stroke, 10 feet; capacity, pushing, 127 tons, pulling, 95 tons; working pressure, 1000 pounds per square inch; piston rod, 9 inches diameter; from floor to center of die head, 30 inches; from rails to center of die head, 8 inches; diameter hole through die head, $11\frac{1}{2}$ inches; floor space, 337 by 47 inches; supply pipe, 4 inch double extra.

Weight, 45020 pounds. Price, \$.....



Similar machines designed to be driven from an accumulator system are described on page 62 H and dimensions are given on page 61 H.



12 by 60 Inch Vertical Hydraulic Drawing Press (1897)
ACCUMULATOR DRIVEN. WITH AUTOMATIC REVERSING VALVES.

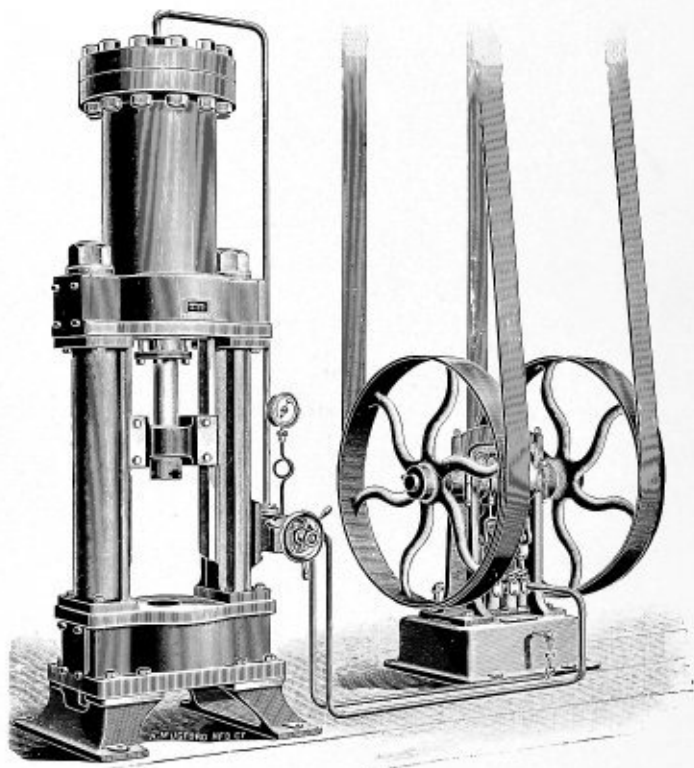
12 by 60 Inch Vertical Hydraulic Drawing Press (1897)

**ACCUMULATOR DRIVEN.
WITH AUTOMATIC REVERSING VALVES.**

The press illustrated opposite is used to redraw cups (such as No. 1037, page 57 H makes) into forms suitable for finishing in horizontal draw benches (page 88 H). There are two tie rods in this machine, one within each rail. The rails guide the crosshead rigidly and also form a support for the cylinder. Rubber packing is used on the piston, square flax on the rod. The cylinder is cast iron, the upper head bolted on, the lower screwed in. The punch is held in the lower end of the piston rod. The base and rails are cast iron, the tie rods forged steel. This press is fitted with automatic controlling valves similar to those described on page 63 H. The power used is derived from an accumulator system. We can attach special valves which will cut off the accumulator supply and substitute low pressure water to move the ram during that portion of the stroke that requires little power. The upright shaft in the cut connects with a throttle valve and is used to stop the machine. Provision is made for operating a stripper in the die bed from the crosshead.

SPECIFICATIONS.

Diameter of piston.....	inches	12
Length of stroke.....	"	60
Capacity, pushing.....	tons	56½
Working pressure.....	lbs. per sq. in.	1000
Diameter of piston rod.....	inches	6
From floor to top of base.....	"	20
Top of base to ram when down.....	"	8
Top of base, front to back.....	"	22
Distance between uprights at base.....	"	20
Diameter hole through bed.....	"	10
Floor space.....	"	54 by 24
Size of supply pipe.....		2x
Extreme height.....	feet	16
Weight.....	pounds	12070
Price.....	\$	.....



Vertical Drawing Press (1344) and Pump (1344 A)

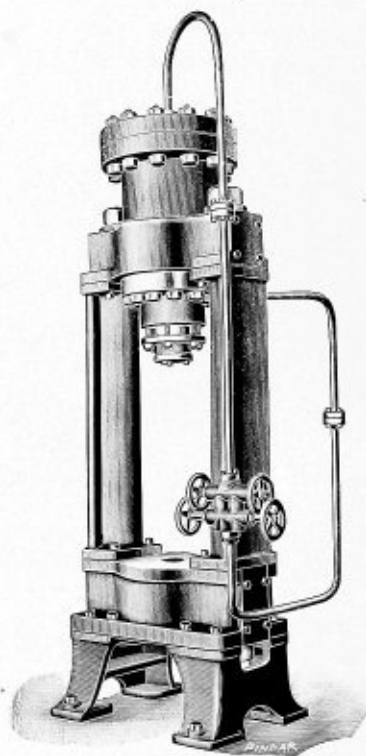
This press is suitable for making a great variety of drawn work. With the pump (see page 117 H) and connections shown it forms a convenient plant for use where a single hydraulic press is needed. The press is of the same general design as No. 1897 (page 67 H). Dimensions of the press are given in the table on the next page. The valve shown is used to stop or reverse the press at will. It is listed on page 145 H as 1344 B. If the press is to be run from an accumulator system a different valve should be used.

Vertical Hydraulic Drawing Presses.

Vertical hydraulic drawing presses Nos. 1260 and 2086, listed below, are similar in general design to the press shown in the cut on the opposite page. Press No. 1260 will draw cups up to 8 inches diameter, 30 inches long. It can also be used as a blanking press. The valve, No. 2086 A, page 145 H, which is included with both of these machines, is designed for use with a steam or power pump and is mounted on a separate foundation. If used with an accumulator system, other valves are required. Press 2746 (photo 867) is of the same general design as 1344 opposite, and is driven in the same way and has the same kind of valve.

SPECIFICATIONS.

Number of Machine	1344	2746	1260	2086
Diameter of piston..... inches	12	14	20	20
Length of stroke..... "	26	26	36	56
Capacity, pushing..... tons	113	154	125½	157
Working pressure.... pounds per square inch	2000	2000	800	1000
Diameter of piston rod..... inches	5	7	8	9
From floor to top of base..... "	24	26	24	34
Top of base to ram when down..... "	7	11½	14	14
Top of base, front to back..... "	22	22	29	34
Distance between uprights at base... "	19½	22½	26	30½
Diameter hole through bed..... "	8	6½	14	14
Floor space..... "	47 by 35	59 by 35	55 by 40	68½ by 48
Extreme height..... "	122	136	148	209
Size of supply pipe.....	1x	1¼x	3x	3x
Weight..... pounds	9250	15700	17625	30780
Price..... \$	-----	-----	-----	-----



113 Ton Vertical Hydraulic Press (2957)

12 INCH RAM.

15 INCH STROKE.

113 Ton Vertical Hydraulic Press (2957)

SLOW SPEED.

This press is designed especially for lead pencil work, to be used in pressing graphite through molds, but it may be used for any purpose requiring a press of this type where the work is such that a slow ram speed is required. For ordinary speeds the valve is so small that excessive throttling would cut down the pressure. The cylinder is copper lined, and the piston rod is copper covered. The valve is of the screw plug type and is designed to be used with an accumulator system.



30 Ton Vertical Hydraulic Press (3025)

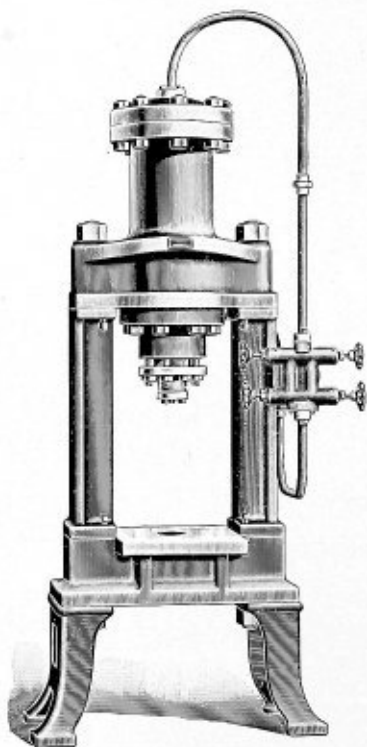
SLOW SPEED.

This press is designed especially for lead pencil work, to be used in pressing graphite through molds, but it may be used for any purpose requiring a press of this type. The cylinder is copper lined, and the piston rod is copper covered; the valve is of the screw plug type and is designed to be used with an accumulator system. Note the cut of this press on the next page.



SPECIFICATIONS.

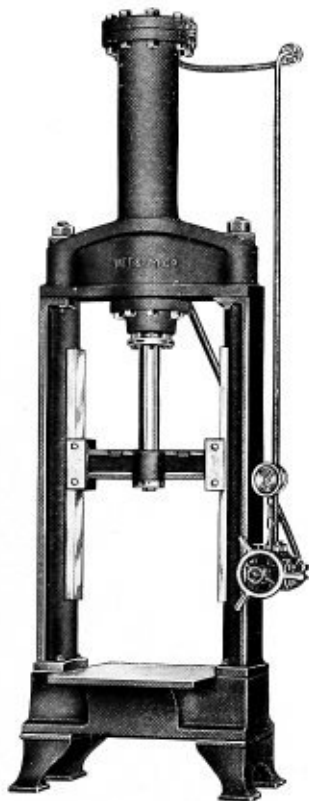
Number of Machine	2957	3025
Diameter of piston..... inches	12	6 $\frac{1}{4}$
Length of stroke..... "	15 $\frac{1}{8}$	15
Capacity, pushing..... tons	113	30 $\frac{1}{2}$
Working pressure..... lbs. per sq. in.	2000	2000
Diameter of piston rod..... inches	7	3 $\frac{1}{2}$
From floor to top of base..... "	30	23 $\frac{3}{4}$
Top of base to ram, when down..... "	25	2 $\frac{3}{4}$
Top of base, front to back..... "	22	22
Distance between uprights, at base..... "	19 $\frac{1}{2}$	15
Diameter of hole through bed..... "	4	3 $\frac{1}{2}$
Extreme height..... "	131	89
Floor space..... "	42 by 54	24 by 41
Size of supply pipe..... "	1xx	$\frac{3}{4}$ xx
Size of exhaust pipe..... "	1 common	$\frac{3}{4}$ common
Weight..... pounds	9060	2390
Price..... \$	.....	.....



30 Ton Vertical Hydraulic Press (3025)

6 1-4 INCH RAM. 15 INCH STROKE.

See preceding page.



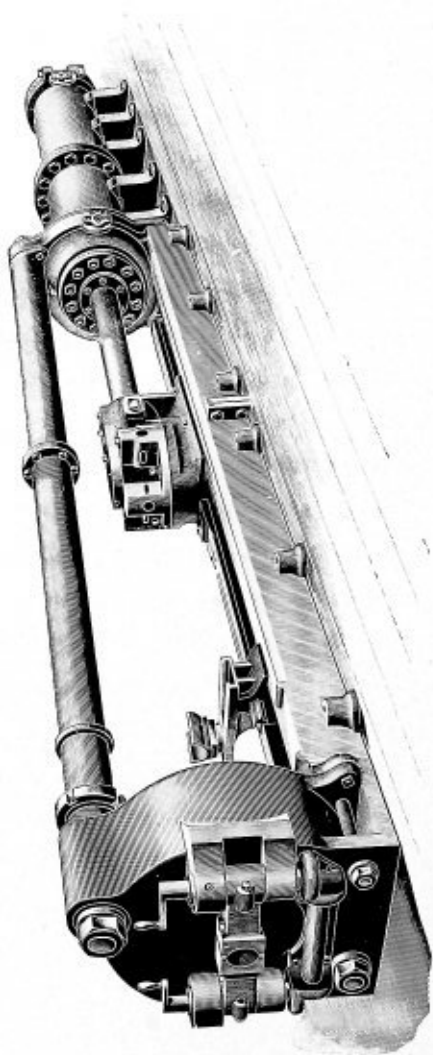
40 Ton Hydraulic Press (3159)

This press is roomy in the tool space, and in consequence can be used in making **large trays**, and for similar operations in the manufacture of thin metal objects, or it can be used for drawing through a die, the removal of a plug in the bottom platen giving a hole through the bed 16 inches in diameter.

The reversing and bypass valve is adapted for direct connecting to a pump.

The piston is $7\frac{1}{4}$ inches diameter, $40\frac{1}{8}$ inches stroke; working pressure, 2000 pounds per square inch; piston rod, $4\frac{1}{4}$ inches diameter; pushing capacity 40 tons; floor to top of lower platen, 23 inches; lower platen to end of ram when down, 14 inches; top of lower platen is 36 inches front to back, and 30 inches in the clear between the uprights; floor space, 56 by 42 inches; extreme height $106\frac{1}{2}$ inches; supply pipe $1\frac{1}{4}$ xx.

Weight including valve, 7745 pounds. Price, \$.....



18 Inch by 18 Foot Three Rod Hydraulic Push Bench (2194)

PUSHING CAPACITY, 254 TONS.

WORKING PRESSURE, 2000 POUNDS PER SQUARE INCH.

PATENTED SEPT. 30, 1902.

Horizontal Two and Three Rod Hydraulic Push Benches.

PATENTED SEPT. 30, 1902.

Number of Machine	2194	3145	3041	2938	2195	2939	2940
Diameter of piston..... inches	18	16	14	12	12	10	8
Length of stroke..... feet	18	23	18	18	18	18	18
Capacity, pushing..... tons	254½	201	154	113	113	78½	50
Capacity, pulling..... "	191	150½	115½	85	85	59	38
Working pressure..... lbs. per sq. in.	2000	2000	2000	2000	2000	2000	2000
Diameter of piston rod..... inches	9	8	7	6	6	5	4
From floor to center of die head, "	29½	29½	29½	29½	29½	29½	29½
Diameter hole through die head, "	21	12	8	10	8	9	8
Top of bed to center of die head, "	16½	13	11	11	11	9	7½
Greatest width of bench..... "	50	47	42½	42½	42½	37	35
Length over all..... feet and inches	47-9	57-9	45-9	45-5	46-6	44-9	43-11
Size of supply pipe.....	4XX	4XX	3XX	3XX	3XX	3XX	2X
Weight, including valves..... pounds	94500	89000	57430	50700	51280	33280	22670
Price, including valves..... \$							

18 Inch Three Rod Hydraulic Push Bench (2194)

ACCUMULATOR AND DIRECT DRIVEN.

This bench is used for cupping blanks and for the first drawings of the cups, for drawing tubes started on a larger machine or for breaking down tube castings. The cups and tubes are drawn over an arbor or punch when the bench is used for pushing. It is arranged to be driven directly from a pump (2000 pounds pressure) or from an accumulator system (1000 pounds pressure), all the necessary valves for operating from either system at will being provided. It is shown on page 74 H and also in photo 549.

The die head is connected to the cylinder by three forged steel rods, the top one slightly to one side of the center of the machine, so as to give room for handling the tubes by overhead hoists. These rods are inclosed by the rail above and the bed below. The die head has a **stripper** attached to it, there being two bronze blocks (easily changed to fit different sized punches) which are moved in behind the tube by turning either of the handles shown. The return stroke of the piston moves the tube against the blocks and removes it from the arbor. The stripper can be swung around out of the way if desired. To prevent sagging of the longer punches during drawing, a **saddle** is provided, which follows the crosshead away from the die and stops at half stroke, returning to the die with the crosshead. It swings out with the turret and supports the arbor while the tube is placed over it. The arbor is held in and keyed to the turret on the crosshead. To do away with the necessity for any unreasonable upsetting of the ends of the punches, there are four holes in the **turret**, 6, 5, 4 and 3 inches diameter, only one of them holding a punch at any one time. There is a wedge adjustment between the turret and crosshead to take the thrust due to pushing the tube through the die. The crosshead has bronze shoes between it and the bed. The bed is cast iron and is arranged for use as a settling tank for oil. The cylinder is of the best charcoal iron, its heads leather packed, the front head bolted to it and the rear head held in place by clips easily removable after taking off two bolts.

The piston and piston rod are of forged steel with square flax packing for the piston. This packing is removed or tightened by removing the rear head and taking off or adjusting the follower and its nut. The piston rod is outside packed by square flax packing held in place by a bronze gland.

The bench is **operated** as follows: The punch is swung by hand to one side of the die head, the tube slid over it, and it is then swung back and locked in place, central with and directly in front of the die. The water is turned on and the tube pushed through the die. Then the stripper is interposed between the tube and die head and the tube is removed by reversing the machine. After the punch has receded far enough, it can be swung out and the operation repeated.

For **cupping blanks**, this bench may have a pressure plate attachment, which is held in place by wedges held by the lugs on the bed and by the nut and shoulder on the upper rail. This attachment is not furnished unless specially ordered. It will cup a disc 35 inches in diameter. Price, extra, \$

Since the punch swings to one side only, and all blanks are fed from that side, which is left clear and open for the purpose, the valves and piping are best located on the other side of the bench. The **valves** are in a shallow pit at the side of the cylinder and the controlling shafts and pipes run along under the floor to a pedestal plate near the position of the saddle in the cut. On this plate are two pedestals supporting two handwheels, one for reversing the bench, the other for regulating the speed when accumulator driven also a pilot valve for starting and stopping the bench when direct driven. These are so situated that the operator is in sight of every operation. The valves are as follows: One reversing valve, No. 2194 B, page 147 H; one throttle valve, No. 2194 C, page 146 H; two stop valves, No. 2225 A, page 148 H; one bypass valve, No. 2194 A, page 142 H. They are mounted on a suitable base plate and all necessary fittings for connecting them with one another and with the bench are provided. With the bench are furnished foundation plans, anchor plates, and bolts.



18 Inch Three Rod Hydraulic Push Bench (2194)

ACCUMULATOR DRIVEN ONLY.

In many cases it is necessary to install the valves for the accumulator system only, omitting those for the direct drive from a power pump. Doing this lowers the cost and weight and leaves the bench equipped with these valves; one reversing valve; one throttle valve; one stop valve; one base for mounting these three valves.

Weight, 92900 pounds. Price, \$.....



12 Inch Three Rod Hydraulic Push Bench (2195)

This bench resembles No. 2194 closely, but, owing to its smaller size, the provisions for a pressure plate and for the double water supply are omitted. The valves furnished are shown in the cut on page 146 H, and are for 1000 pounds pressure for use with an accumulator system only; the holes in the turret are 6, 5, 4 and 3 inches diameter; an arbor support is included. Photo 563 shows this machine.

16 Inch Three Rod Hydraulic Push Bench (3145)

This machine is exactly the same general design as No. 2194, described on page 76 H, but has no provision for a pressure plate or for the direct piping from a power pump; it is arranged to take its water supply from an accumulator system; an arbor support is included; the holes in the turret are four in number, 6, 5, 4 and 3 inches in diameter; the valves furnished are included under 2194 E, page 147 H, specification is given in the table on page 75 H.



14 Inch Three Rod Hydraulic Push Bench (3041)

Is of the same design as No. 2194, illustrated on page 74 H; has only the accumulator supply valves; has no pressure plate or arbor support; the holes in the turret are 6, 5, 4 and 3 inches diameter; the valves are shown in the cut on page 146 H; for sizes and other data concerning this machine see page 75 H.



12 Inch Three Rod Hydraulic Push Bench (2938)

What is said above concerning No. 3041 applies to this machine in every way.



10 Inch Two Rod Hydraulic Push Bench (2939)

The two smaller sizes of the list on page 75 H are characterized by the same features that are embodied in the larger machines. This is shown in photo 1050. They were designed to be used for pushing tubes on arbors and have the same stripper that is described on page 76 H. The die head, bed, tie rods, piston and cylinders are substantially as furnished for the 18 inch bench but the valves are somewhat different in design. They are to be used with an accumulator system and are mounted under the main cylinder, the controlling handles being bolted to the side of the bed opposite to that the punch swings out on. These machines have no pressure plate or arbor support; the holes in the turret are 3, 4 and 5 inches diameter; one throttle and one reversing valve but no stop valve are included with the machine.



8 Inch Two Rod Hydraulic Push Bench (2940)

What has just been put down relative to the 10 inch bench applies to this one as well. There is, however, no 5 inch hole in the turret. Specifications of this machine are given on page 75 H.

18 Inch Hydraulic Push Bench (3237)

This machine, which is made with the two different strokes given below, is a two rod machine closely resembling No. 830, page 80 H; it differs in having a two rod **extension** of an open type added and in being equipped with the **strippers** shown in the cut of No. 2194, page 74 H. It is used with the short stroke for pushing tubes over a punch or arbor and for drawing tubes over a triblet held in the extension; with the longer stroke it is used only for drawing.

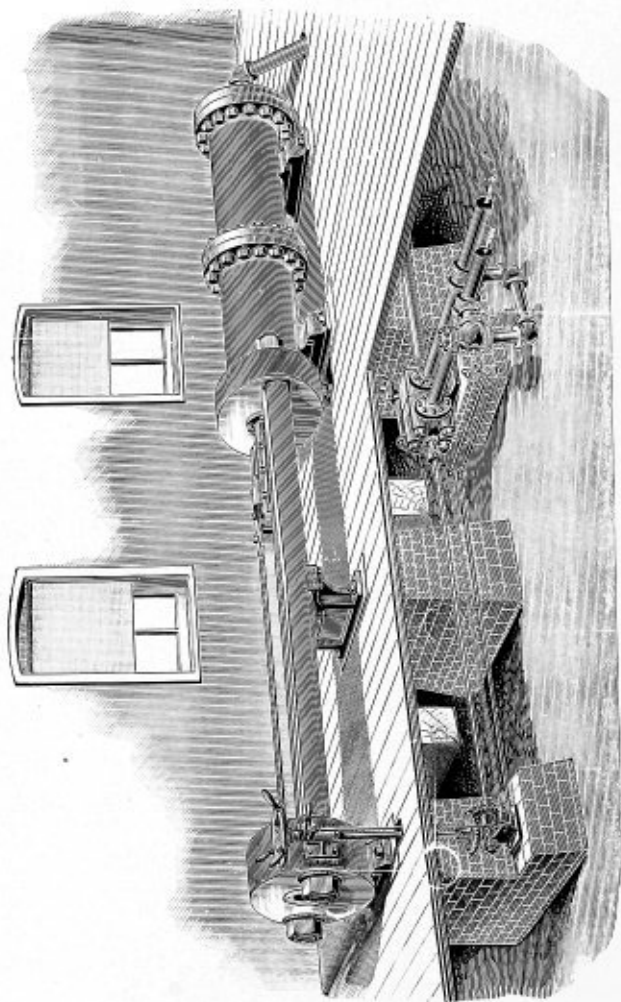
The die head is tied to the cylinder by two rods which pass through the crosshead guides and have nuts at both ends. The stripper blocks are moved simultaneously in onto the punch by turning a handle and can be swung out of the way if desired; they are pivoted on bearings bolted to the die head. The **die holder** is suspended from an air hoist overhead (this is not furnished by us) and fits between the die head and tapered lugs on the guides. The crosshead is of the front slot type and is designed for holding arbors keyed into place. An **arbor support** for holding up and for steadying the punch is part of the bench; it is moved back and forth along the guides automatically. At the end of the extension is a head in which slides an adjustable square block hollowed out so that a triblet will drop into it. A suitable filler is provided for use in pushing.

Anchor plates, legs, base plates, die and extension legs, guides, cylinders and cylinder heads are of cast iron. The anchor bolts, tie and extension rods, piston rod and triblet holder are forged steel. The die holder, crosshead, stripper arms and tie rod nuts are steel castings. The arbor support bushings, stripper blocks, glands and packing rings are bronze. The packings for the piston head are rubber; for the piston rod, flax; rubber for the cylinder heads, both of which are bolted on.

The **valves** are one reversing valve (2195 B) and one throttle valve (2195 C) as shown on page 148 H; they stand in a pit under the cylinder of the bench and are controlled by two handwheels just this side of and to the left of the die head as one looks at it from the cylinder head; the connections are below the floor.

SPECIFICATIONS.

Diameter of piston.....	inches	18	18
Length of stroke.....	feet and inches	16-6	26-10
Pushing capacity.....	tons	127	—
Pulling capacity.....	"	108	108
Diameter of piston rod.....	inches	7	7
From floor to center of die head.....	"	27	27
Diameter of hole through die head.....	"	6½	6½
End of crosshead forward to die head.....	"	11½	½
Distance between rails.....	"	19½	19½
Rear of die head to front of extension head.....	"	192	192
Triblet holder holds a rod of diameter.....	"	2¼	2¼
Greatest width of bench.....	"	77	77
Length overall.....	feet and inches	58-2	78-0
Working pressure.....	lbs. per sq. in.	1000	1000
Size of supply pipe.....	"	3xx	3xx
Weight including valves.....	pounds	52260	67030
Price including valves.....	\$		



22 Inch by 10 Foot Hydraulic Push Bench (830)

PUSHING CAPACITY, 190 TONS WORKING PRESSURE, 1000 POUNDS PER SQUARE INCH.

Hydraulic Push Benches.

Number of Machine	2114	830	1162	21	759	605	760	740	690
Diameter of piston..... inches	22	22	20	20	18	18	15	14	12
Length of stroke..... feet	10	10	6	16	22	4 $\frac{3}{4}$	16	20	16
Capacity, pushing..... tons	304	190	282 $\frac{1}{2}$	157	108	127	88	77	56 $\frac{1}{2}$
Capacity, pulling..... "	241	151	225 $\frac{1}{2}$	143	96	108	74	67	48 $\frac{1}{2}$
Working pressure..... lbs per sq. in.	1600	1000	1800	1000	850	1000	1000	1000	1000
Diameter of piston rod..... inches	10	10	9	6	6	7	6	5	4 $\frac{1}{2}$
From floor to center of die head..... "	22	22	22	28	27	27	28	28	28
Diameter hole through die head..... "	10 $\frac{1}{2}$	12 $\frac{1}{2}$	12 $\frac{1}{2}$	14	13 $\frac{1}{2}$	9	13 $\frac{1}{2}$	9 $\frac{1}{2}$	14 $\frac{1}{2}$
End of piston rod when forward to die head .. "	8	10	10	6	5	3 $\frac{1}{2}$	4 $\frac{3}{4}$	6 $\frac{1}{2}$	3
Distance between rails..... "	36	36	32	16	20	19	16	16	15 $\frac{1}{2}$
Greatest width of bench..... "	57	57 $\frac{1}{2}$	57 $\frac{1}{2}$	42	41	40 $\frac{1}{2}$	35 $\frac{3}{4}$	35 $\frac{3}{4}$	32 $\frac{1}{2}$
Length over all..... feet and inches	28-8	27-11	20-4 $\frac{1}{2}$	38-11	51-3	14-11	38-6	46-8	38-0
Size of supply pipe.....	4XX	4XX	3XX	3XX	4XX	3X	3X	3X	2X
Weight, including valves..... pounds	52750	46500	39300	49500	43400	17450	31160	35400	21400
Price, including valves..... \$	.....	.....	.....	.....	.....	.....	.....	.....	.....

Hydraulic Push Benches.

These benches, listed on page 81 H, are used for pushing cups, tubes, cartridge cases and similar articles through the dies, the punch itself serving as an arbor and determining the inside diameter of the finished work. The illustration on page 80 H shows the general design. The benches are of the two rod type, the rods, of forged steel, running from die head to cylinder inside the guides. The front cylinder heads are screwed



in, the rear bolted on. The cylinders are of the best charcoal iron.

No. 2114 has the rear supply pipe enter the cylinder through its walls, instead of through the rear head, as illustrated on page 80 H. The punch is held in the end of the piston rod, which is rigidly guided by the crosshead, which has brass gibs on its wearing surfaces. The bench is used in drawing cartridge cases. It is directly driven from a steam pump and valve No. 1691 A (page 145 H) is used with it.

No. 830, see cut page 80 H, is also driven directly by a pump, and valves 830 A (page 145 H) and 822 B (page 142 H) are used to control it. The piping shown in the cut was an arrangement used to satisfy certain conditions and therefore would not be adopted for all benches. The reversing valve is operated by the handwheel on the die head and the small handle beneath operates the bypass valve.

No. 1162 is for drawing cartridge cases. It is driven from a steam pump and a valve similar to No. 2086 A (page 143 H) is used with it.

No. 21 is driven directly from a power pump. The valves furnished with it are similar to No. 822 B (page 142 H) and No. 822 A (page 143 H). The bench is used for breaking down tube castings.

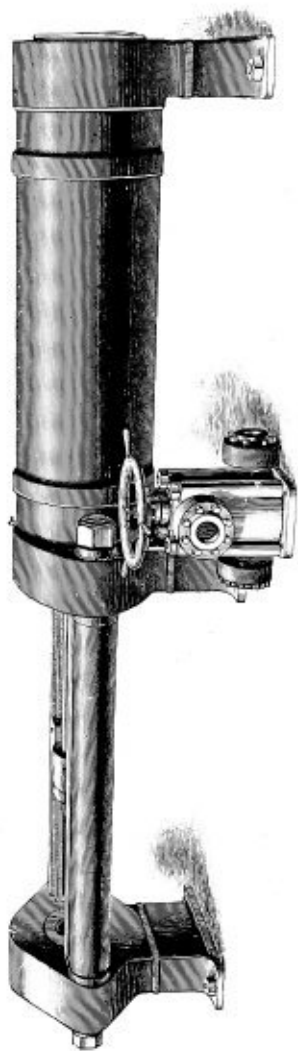
No. 759 is for breaking down seamless tube castings and for finishing the larger sizes. It can be used either as a push bench, or as a "push and pull" bench, the pull or return stroke of the piston being utilized for a second drawing of the tube. Lift No. 92 (page 152 H) is used with this bench but not furnished with it. No. 759 has a pipe extension and the same valves as are used on No. 21.

No. 605 is a push bench for drawing cartridge cases and is driven by a steam pump. A valve similar to No. 2086 A (page 143 H) is used to control it.

No. 760 is not as strong as No. 759 (described above) but is of the same design.

No. 740 is a push and pull bench and has a pipe extension. It uses the same valves as No. 759.

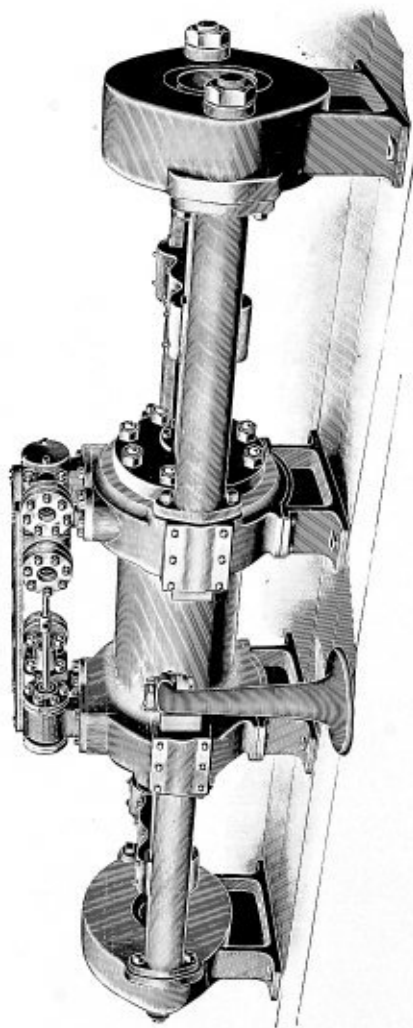
No. 690 is also of the same general design as No. 759 and uses the same valves. It has no extension.



18 Inch by $4\frac{2}{3}$ Foot Hydraulic Push Bench (605)

PUSHING CAPACITY, 127 TONS.

WORKING PRESSURE, 1000 POUNDS PER SQUARE INCH.



20 by 42 Inch Double End Hydraulic Push Bench (2354)

PUSHING CAPACITY, 107 TONS. WORKING PRESSURE, 750 POUNDS PER SQUARE INCH.

Hydraulic Push Benches.

STYLE.	DOUBLE END.		STEEL CYLINDER
	2354	548		1172
Number of Machine			1170
Diameter of piston..... inches	20	12	16
Length of stroke..... feet	3½	3½	10
Capacity, pushing..... tons	107	48½	301½
Capacity, pulling..... "	107	48½	40
Working pressure..... lbs. per sq. in.	750	1000	3000
Diameter of piston rod..... inches	6	4½	8½
From floor to center of die head..... "	28	28	17
Diameter hole through die head..... "	12	8	12
End of piston rod when forward to die head..... "	0	5½	6
Distance between rails..... "	23	17	30
Greatest width of bench..... "	42	29½	53
Length over all..... feet and inches	18-9	16-10	32-2½
Size of supply pipe.....	3 XX	3 X	2½ XX
Weight..... pounds	26650	8420	34000
Price..... \$			6970

Hydraulic Push Benches.

WITH STEEL CYLINDERS.

These benches, described in the list on page 85 H, are used for hot cupping and hot drawing steel tubes. Both have **copper lined** cylinders and cylinder heads made from steel castings. Otherwise the general design is that of the plain push benches just described on page 82 H. No. 1172 has a double die holder, two reductions of short tubes taking place in one pass. Each die has its own adjustments. No valve is furnished with this bench. No. 1170 has valves for use with an accumulator system. Both benches have "open top" die heads.



Double End Hydraulic Push Benches.

Hydraulic benches are made **double ended**, as is shown on page 84 H, so that drawings of **two** cups or tubes can be made for **one** complete stroke of the piston. There is one cylinder, the piston rod passing through both heads and each crosshead holding a punch. These machines are economical of water when used with an accumulator. No. 2354 has valves similar to those described on page 63 H, and they are controlled by the handle on the valve stand. The bench can be started, stopped, or reversed, at will. There is no provision for the operation of the valve by the crosshead. No. 548 has valves 549 (page 144 H) furnished with it.



Hydraulic Pull Benches.

These benches resemble the push benches described on page 82 H, but they have smaller piston rods and are used for pulling only. The die is held in a plate slid into the die holder from the top, there being a gap through the die holder (as shown on page 89 H) instead of a circular opening.

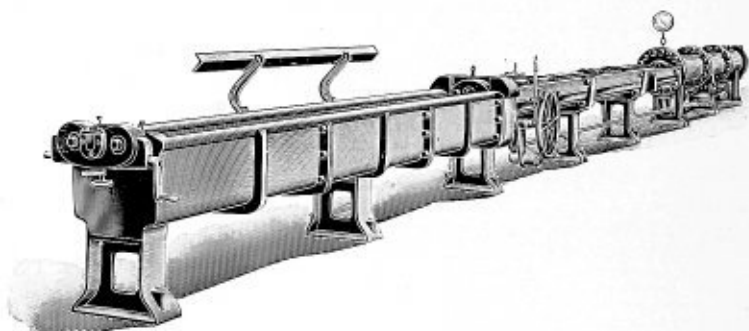
No. 19 has a triplet **extension**, made up of hollow iron columns supported on legs and with a triplet holder at the end. Length without extension, 55 feet 8 inches.

Nos. 52, 43, and 47 resemble one another closely. They are used for drawing brass tubes and are provided with pipe extensions and triplet holders. The cylinders are of the best charcoal iron, the piston rod of forged steel, keyed to the crosshead. The piston is rubber packed, the rod outside packed with square flax packing held in place by a bronze gland. There are inside and outside rod supports for the piston rod. The crosshead is adapted to receive either tongs or double jaw grips for holding the tube. They have the solid guides shown in the cut on page 88 H. These benches are accumulator driven and suitable valves are provided with them.

Nos. 908 and 1671 are pull benches with cast iron guides and no tie rods. The chief difference between them and those described above and on pages 88 H to 91 H is that the tube when being drawn is not down between the guides but up above them **in the open** as with chain draw benches. With No. 1671 a tank triplet extension is included, the length without it being 56 feet 4 inches. Suitable valves are included with both benches.

Hydraulic Pull Benches.

	19	52	43	47	908	1671
Diameter of piston..... inches	14	14	12	10	15	10
Length of stroke..... feet	24½	22	22	22	16	25
Capacity, pulling..... tons	100½	69½	52	36	84	33½
Working pressure..... lbs. per sq. in.	1500	1000	1000	1000	750	1000
Diameter of piston rod..... inches	5	4 ⁵ / ₁₆	3 ³ / ₁₆	2 ⁵ / ₁₆	3 ¹ / ₄	3 ¹ / ₄
From floor to center of die head.....	31	28½	31	31	30	30
Width of opening through die head.....	12 ¹ / ₄ dia.	12	12	9	16	16
End of crosshead forward to die head....	0	4 ¹ / ₄	4 ¹ / ₄	3 ¹ / ₄	¾	0
Distance between rails.....	14	14½	14½	10	11½	11½
Greatest width of bench.....	32	34	34	28	30	42
Length over all.....feet and inches	72-1	50-6	50-5	50-2	37-11	76-8
Size of supply pipe.....	3" x	4 x	3 x	3 x	3 x	3 x
Weight..... pounds	42000	25780	22165	14508	29700	30545
Price, with suitable valves..... \$						



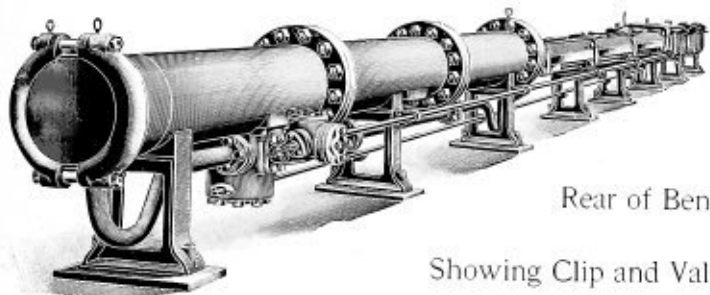
12 Inch by 22 Foot Draw Bench (2417)

Hydraulic Draw Benches

FOR PULLING ONLY.

These benches are used for drawing **brass or steel tubes** over a triblet and are all provided with an extension for holding the triblet rod. They are driven from an accumulator system. We have recently improved these machines so that they are simpler and more durable, easy to control, and work extremely fast. The **advantages** that hydraulic benches of this class have over the ordinary forms of chain draw benches include the following: The hydraulics have perfect control of speed, and can be started gradually; they can be stopped while the tube is being drawn, the grip is returned to the die by power, and they turn out a much larger number of tubes in a given time.

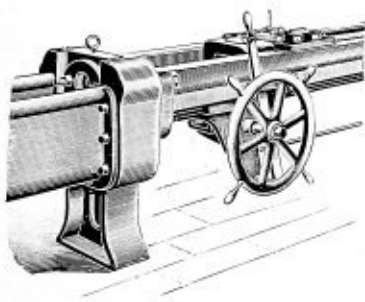
The cylinders are of the best charcoal iron, with the various sections strongly bolted together and the joints lead packed. The rear cylinder head may be bolted on (Style K) and lead packed, or it may be held on by clips (Style L, shown in the cut opposite) and packed with leather. As the clips may be taken off after removing only two bolts, we recommend them on the ground that their use makes the adjustment or repacking of the piston easier.



Rear of Bench

Showing Clip and Valve

The valves for operating these benches are listed on page 149 H. One complete valve is included with each machine as well as the operating rig.

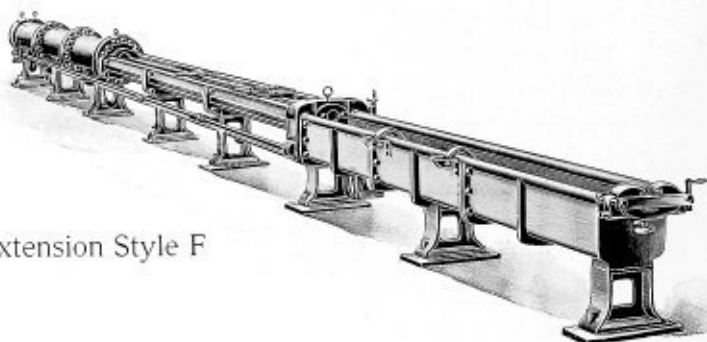


STYLE A

There are two styles of operating handles, Style A, here illustrated, and Style B, shown in the cut on page 90 H. Either style can be furnished as desired. These valves are bolted beneath the cylinder, as shown above, and their design is such that the return stroke is made with a comparatively small loss of power, the only water used being that displaced by the piston rod. Style C, for bench No. 2365, includes the set of valves 2195 E (page 147 H) except No. 2195 A

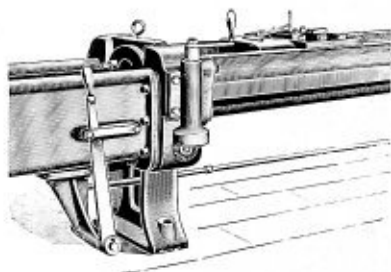
and also the necessary controlling stand and shafts. The design of the bench is such that it is impossible to attach valve No. 2390 A to it.

The piston rods are forged steel, keyed to the crossheads, and with an enlarged end for the piston itself, which is packed with square flax packing held in place by a follower and follower nut. The piston rod is supported both inside and out by suitable supports connected by rods passing through the front head. As the speed of these benches is high, a suitable device is provided to prevent shock when the crosshead comes up to the outside support and moves both of them along.



Extension Style F

The die is held in a steel plate in the die head, which is open along the top as is shown below. The die head, guides and extension are all cast iron. The grip and crosshead are steel, the former holding two sliding jaws which will grip a rod or tube placed between them if they are closed by the jaw pusher, whose handle in the cut sticks up from the crosshead. In all the

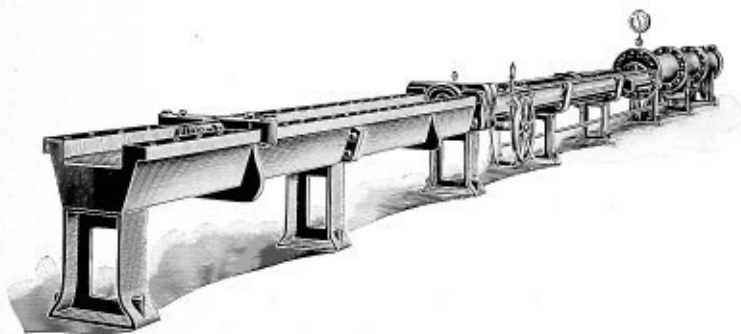
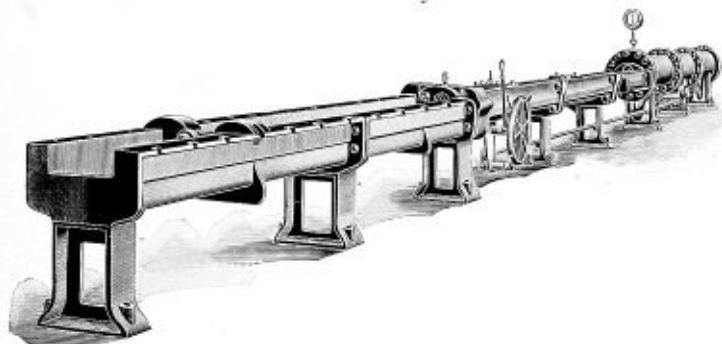


STYLE B

benches the grip and crosshead are separate, the crosshead fitted accurately to the guides and held in place by caps, the grip adjustable up and down in the crosshead.

These benches have three styles of triblet extensions, E, F and G. The extension is a trough for holding slush or other lubricating substances in which the tubes lie before they are drawn through the die. On its front end is the triblet holder. In style F (shown in the cut above) the holder is at the extreme end, and has a slight adjustment toward the die. With this style all triblet rods used on the bench are the same length, irrespective

Extension Style G.



Extension Style E.

of the length of the tube drawn. The brass drawing benches have a spring attachment which pushes the triblet rod toward the die. In styles E and G the triblet holder slides along the extension and can be fastened to it where desired. This enables a short triblet rod to be used with a short tube. All three styles have provision for a sensitive adjustment of the triblet in the die. The support shown above the extension in the cut on page 88 H can be lowered into it and used to hold up the triblet rod and tube.

The gauge shown in the cut of No. 2417 is furnished only with Nos. 2415, 2416 and 2417. We include with each bench foundation plans, plates and bolts, as well as the piping from the valves to the cylinder. No. 2417 is shown on page 88 H and also on photo 662.

Hydraulic Draw Benches.

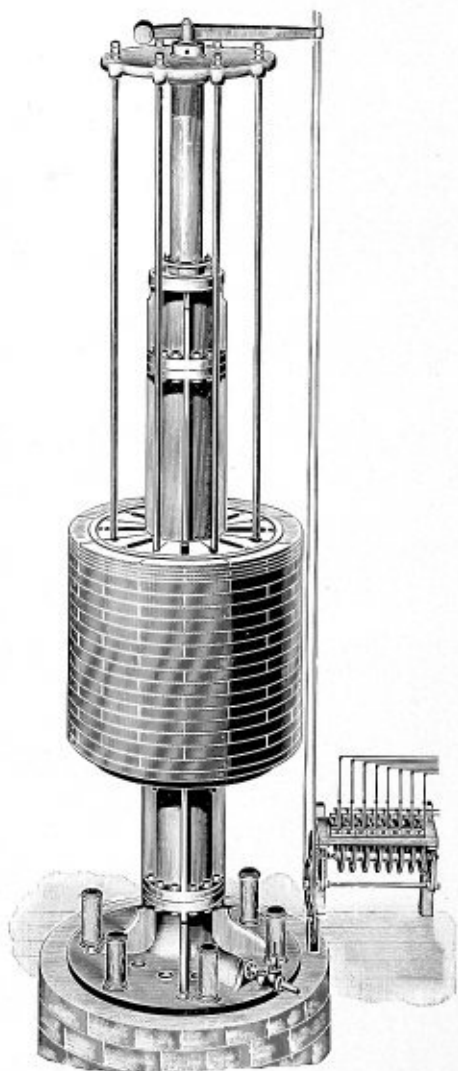
	2365	2201	2417	2877	2391	2853	2204	2202	2416	2390
Number of Machine										
Diameter of piston.....	15	12	12	12	12	12	10	10	10	10
Length of stroke.....	16	22	22	25	22	27	22	22	22	22
Capacity, pulling.....	111	71½	50½	50½	50½	50½	49½	40½	34½	34½
Working pressure..... lbs. per sq. in.	1500	1500	1000	1000	1000	1000	1500	1500	1000	1000
Diameter of piston rod.....	6	4½	4	4	4	4	4	4	3½	3½
Floor to center of die head.....	32	32	32	32	32	32	32	32	32	32
Width of opening through die head.....	17½	16	13½	13½	13½	13½	13½	13½	13½	13½
Size of die plate.....	22½x22	17½x12	15½x11	15½x11	15½x11	15½x11	15½x11	15½x11	15½x11	15½x11
Thickness of die plate.....	6	4	2½	2½	2½	2½	2½	3	2½	2½
Diameter of tube or plug grip will hold.....	3½	3	2	2	2	2	2	2	2	2
End of grip forward to die head.....	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾
Distance between guides.....	19½	15½	13½	13½	13½	13½	13½	13½	13½	13½
Greatest width of bench.....	37	34	28½	28½	28½	28½	28½	28½	28½	28½
Length, with extension..... feet and inches	52-7	71-1	68-0	57-7	60-0	84-2½	68-7½	70-2½	67-7	68-7½
Size of supply pipe.....	3 xx	4 xx	3 xx	3 xx	3 xx	3 xx	3 xx	3 xx	3 xx	3 xx
Weight..... pounds	51750	40200	33960	*35000	34400	42830	30500	20520	29220	30050
Price, with suitable valves..... \$										
Style of valve handles.....	C	A	A	A	B	B	B	A	A	B
Style of rear cylinder head.....	L	K	L	L	L	L	L	K	L	L
Style of extension.....	F	E	F	*	P	P	F	E	F	P

*Has no extension but style F fits the bench.

Hydraulic Draw Benches.

	2025	2878	2879	2415	2196	1771	1039	2221	2027	1720	2223
Number of Machine											
Diameter of piston.....	10	10	8	8	8	8	8	6	6	5	4
Length of stroke.....	22	25	25	22	22	22	18	22	22	22	22
Capacity, pulling.....	33½	34½	21½	21½	21½	21½	21½	12	12	8½	5
Working pressure..... lbs. per sq. in.	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Diameter of piston rod.....	3½	3½	3	3	3	3	3	2½	2½	1½	1½
From floor to center of die head.....	32	32	32	32	32	32	32	32	32	32	32
Width of opening through die head.....	13½	13½	10½	10½	10½	10½	10	10½	8	8	8
Size of die plate.....	15½x11	15½x11	12x10	12x10	12x10	12x10	12x10	12x10	10x8	10x8	11x8
Thickness of die plate.....	3	2½	2	2	2	2	2½	2	1½	1½	1½
Diameter of tube or plug grip will hold.....	1½	2	2	2	2	2	2	2	1½	1½	1
End of grip forward to die head.....	½	½	½	½	½	½	½	½	0	½	½
Distance between guides.....	13½	13½	10½	10½	10½	10½	10	10½	8	8	8
Greatest width of bench.....	23½	28½	25½	23	25½	22½	25	25½	20	20	20
Length, with extension..... feet and inches	70-6	57-3	56-6	66-10	67-11	69-2	57-1	67-7	68-0	67-10	66-6
Size of supply pipe.....	2½ x	3 xx	2 x	2 x	2 x	2 x	2 x	2 x	1½ x	1½ x	1½ x
Weight..... pounds	26080	*30000	*19400	18400	19820	16820	13040	15730	11570	9720	11020
Price, with suitable valves..... \$											
Style of valve handles.....	A	A	A	A	B	A	A	B	A	A	B
Style of rear cylinder head.....	K	L	L	L	L	K	K	L	K	K	L
Style of extension.....	G	o	+	F	F	G	E	F	G	G	F

*Has no extension but style F fits the bench.



14 In. by 20 Ft. by 1000 Lb. Hydraulic Accumulator (1722)
WITH BUFFER SAFETY VALVE. CONSTANT PRESSURE.

Hydraulic Accumulators

In General. We build hydraulic accumulators for many purposes, and the list gives detailed information concerning a number that are in successful operation. They are all of the movable plunger type with cheese weights. All parts are of the best charcoal iron, except the gland, which is bronze, and the weight rods and cylinder bolts, which are wrought iron. The cylinder joints are lead packed, the plunger flax packed. The moving parts are guided by the plunger bearing against the top section of the cylinder and by the weight ring sliding along guides on the outside of the cylinder. Overtravel of the plunger is positively provided against by a stop. The base has a widespread foot, which should be bolted to a foundation. These accumulators have buffers at the bottom on which the weights bear when the ram is down.

Uses. The largest accumulators are used with pumping engines or power pumps to furnish water or oil under pressure to hydraulic plants. Some of the smaller ones are sometimes used for the forced lubrication of the step bearings of vertical steam turbines. In this connection the accumulator may act as a reserve for supplying oil when the pump supply is for any reason cut off temporarily. We have designed a number of accumulators for this service. Many of the small machines have been used with a small power pump to supply power to a single hydraulic press. We present in separate leaflets several examples of accumulators, pumps and valves for this purpose all mounted together on a common base plate.

Constant Weight Accumulators. The majority of our machines are designed for giving a constant pressure to the water; and although this pressure can be varied by the process of changing the total weight carried by the plunger, they are not well adapted for the variable pressure hydraulic service demanded in testing and for use with certain forms of hydraulic presses. For this our

Variable Weight Accumulators were especially designed, and several are described in the succeeding pages. They have the weights so held that by shifting three pins from one hole to another in the rods the number of weights raised and consequently the pressure can be varied. Nos. 2075, 1366 A, 2727, 3193, 2430 are so designed that the changes of pressure are by steps of approximately one tenth the maximum pressure. No. 1366 B has a change of pressure from 350 to 275 pounds, obtained by lifting off by hand several light weights. No. 3202 can have its pressure varied by steps of about 95 pounds for each weight. The variable weight accumulators are listed on page 105 H and as there explained many of our constant pressure machines listed on pages 98 to 103 H can be altered to variable pressure if desired.

New Designs. We are prepared to build accumulators of different sizes and capacities from those listed, and we will furnish estimates on such machines on receipt of definite information regarding pressure and capacity, and a statement regarding the conditions under which the accumulator is to be used.

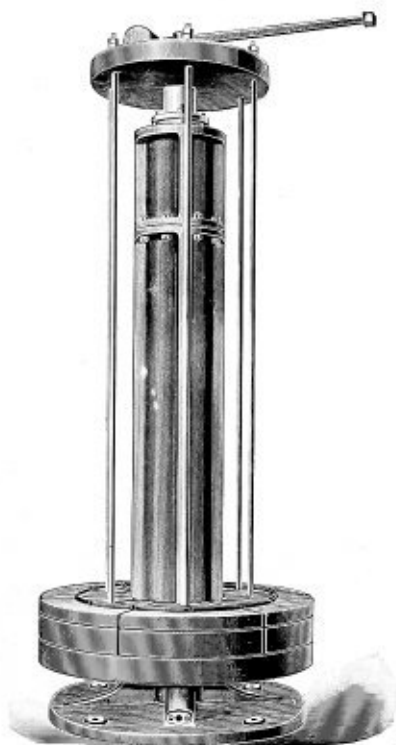
Note. The stand shown at the right of the accumulator in the cut opposite is not a part of the machine and is not furnished with it. Its use is described on page 131 H.



9 Inch by 4 Foot by 100 pound Accumulator (911)

CONSTANT PRESSURE.

The illustration shows a hydraulic accumulator having ram 9 inches in diameter, with a stroke of 4 feet, and weighted to give a pressure of 100 pounds per square inch. We are prepared to build accumulators different from those included in our list on pages 98 to 103 H inclusive, and we will furnish estimates on such machines after receiving definite information regarding sizes and pressure.



6½ Inch by 8 Foot by 275 Pound Accumulator (3052)
CONSTANT PRESSURE.

This accumulator was designed for use in connection with the oiling system of turbo-generators, its function being to provide a **reserve supply of oil** under the proper pressure, in case of the failure of the oil pump. It is equally well adapted for storing under pressure oil or water for any other purpose. Anchor bolts and plates are included.

Hydraulic Accumulators.

CONSTANT PRESSURE.

Design No.	Drawing No.	Diameter of Ram Inches	Stroke of Ram Feet	Working Pressure Pounds Per Square Inch	Capacity Cubic Inches	Size of Pipe	Flour Space Inches Square	Extreme Height Ram Up—Feet and Inches	Weight in Pounds			†Price \$		
									Weights Approximately	Other Parts	Total	Weights	Other Parts	Total
81	66	6	5½	75	1920	1 1/2 C	37	15-0	1200	2100	3300			
12	911	9	4	100	3050	1 1/2 C	32	10-10	4600	3595	8195			
7		3½	5	200	575	1 x	30	12-11	870	2440	3310			
7		3	6	200	690	1 x	30	14-11	870	2570	3440			
10		7 1/2	6	200	12.8G	1 x	56	16-0	2965	8885	11850			
10		7 1/2	8	200	17.1G	1 x	56	20-0	2965	9425	12390			
12		7 1/2	4	200	2260	1 1/2 C	32	10-10	8000	3670	11670			
7	2834 A	3 1/2	5	300	490	1 x	30	12-11	1440	2440	3880			
7		3 1/2	6	300	590	1 x	30	14-11	1440	2570	4010			
12		6 1/2	4	300	1470	1 1/2 x	32	10-10	8000	3760	11760			
10		7	6	300	12G	1 x	56	16-0	6350	8895	15245			
10		7	8	300	16G	1 x	56	20-0	6350	9440	16790			
10	3410	6 1/2	12	300	4770	1 x	56	28-0	4100	10575	14675			
7	1366 B	2	5	350	185	1 x	30	12-10	800	2000	2800			
7		3 1/2	4	400	350	1 x	30	10-11	2310	2310	4620			
8		3 1/2	5	400	440	1 x	30	12-11	2310	2440	4750			
8		4 1/2	4	400	760	1 C	36	10-8 1/2	5280	2560	7840			
8	2429	4 1/2	6	400	1140	1 C	36	14-8 1/2	5280	2850	8130			
12		5 1/2	4	400	1140	1 x	32	10-10	8400	3800	12200			
10		6 1/2	6	400	11.1G	1 x	56	16-0	9315	8905	18220			
10		6 1/2	8	400	14.8G	1 x	56	20-0	8900	9460	18360			
7		3	4	500	335	1 x	30	10-11	2580	2310	4890			
8	1665A	3	5	500	420	1 x	30	12-11	2580	2450	5030			
8		4	4	500	600	1 x	36	10-8 1/2	5200	2570	7770			
8		4	6	500	900	1 x	36	14-8 1/2	5200	2860	8060			
12		4 1/2	4	500	850	1 x	32	10-10	8000	3850	11850			
10		6 1/2	6	500	2380	1 x	56	16-0	11450	8920	20370			
10		6 1/2	8	500	3175	1 x	56	20-0	11450	9470	20920			
19		14	12	500	95G	3 x	84	29-9	56000	34450	90450			
19		14	16	500	127G	3 x	84	37-9	54400	38160	92560			
9	3406	5	8	600	1884	1 x	40	19-5	9000	5200	14200			
22	210	14	20	600	160G	3 x	84	45-8	69000	48000	117000			
7		2 1/2	4	650	310	1 x	30	10-11	3420	2310	5730			
8		3 1/2	5	650	385	1 x	30	12-11	3420	2450	5870			
8		3 1/2	4	650	530	1 x	36	10-8 1/2	6400	2570	8970			
10		3 1/2	6	650	790	1 x	36	14-8 1/2	6400	2870	9270			
10		6 1/2	6	650	2300	1 x	56	16-0	15200	8930	24130			
10		6 1/2	8	650	2930	1 x	56	20-0	14830	9490	24320			
13	3379	8 1/2	10	650	31G	2 x	66	24-6	29500	16150	45650			
13	3409	8 1/2	16	650	50G	2 x	66	36-6	27730	19300	47030			
16	3118	10	14	650	57G	2 x	84	33-7	33600	20680	63280			
19		13 1/2	12	650	89G	3 x	84	29-9	72800	34490	107290			

The capacities for the larger machines are all given in gallons.

†Without buffer safety valve.

Hydraulic Accumulators.

CONSTANT PRESSURE.

Design No.	Drawing No.	Diameter of Ram Inches	Stroke of Ram Feet	Working Pressure Pounds Per Square Inch	Capacity Cubic Inches	Size of Pipe	Flour Space Inches Square	Extreme Height Ram Up—Feet and Inches	Weight in Pounds			†Price \$		
									Weights Approximately	Other Parts	Total	Weights	Other Parts	Total
19		13½	16	650	118G	3x	84	37-9	71200	38230	109430			
23		17	15	650	176G	3x	96	37-3	113250	58550	171800			
23		17	20	650	235G	3x	96	47-3	108100	65400	173500			
28		20	15	650	257G	3½x	114	38-7	165200	80120	245320			
28		20	20	650	343G	3½x	114	48-7	159120	89880	249000			
7		4	5	800	280	½x	30	10-11	3990	2310	6300			
7		5	5	800	350	½x	30	12-11	3990	2450	6440			
8		4	6	800	460	½x	36	10-8½	6800	2580	9380			
8		3	6	800	690	½x	36	14-8½	6800	2880	9680			
10		5	6	800	1710	1x	56	15-10	14420	8750	23170			
10		5½	6	800	2280	1x	56	19-10	14000	9330	23330			
10		6	6	800	2035	1x	56	16-0	17850	8940	26790			
10		6	8	800	2713	1x	56	20-0	17425	9505	26930			
13		8	10	800	26G	2x	66	24-6	31270	16050	47320			
13		8	16	800	41G	2x	66	36-6	30090	19150	49240			
14		9	8	800	26G	2x	72	21-6	40400	19840	60240			
14	3407	9	10	800	33G	2x	72	25-6	40400	20420	60820			
14		9	12	800	39G	2x	72	29-6	40400	21000	61400			
16	3408	10	12½	800	51G	2x	84	30-8	46300	28615	74915			
19		13	12	800	82G	3x	84	29-9	86400	34540	120940			
19		13	16	800	110G	3x	84	37-9	84800	38300	123100			
23		16	15	800	156G	3x	96	37-3	127400	58570	185970			
23		16	20	800	208G	3x	96	47-3	125150	65470	190620			
28		19½	15	800	233G	3½x	114	38-7	192720	80210	272930			
28		19½	20	800	310G	3½x	114	48-7	186640	90020	276660			
7		2	4	1000	260	½x	30	10-11	4560	2310	6870			
7		2½	5	1000	320	½x	30	12-11	4560	2450	7010			
7		3	5	1000	420	½x	30	12-11	5660	2450	8110			
8		3	4	1000	340	½x	36	10-8½	6400	2580	8980			
8		3	6	1000	510	½x	36	14-8½	6400	2890	9290			
10		5	6	1000	1560	1x	56	15-10	16920	8760	25680			
10		5½	6	1000	2080	1x	56	19-10	16920	9550	26470			
10		5	8	1000	2490	1x	56	16-0	21230	8950	30180			
10		5	6	1000	1870	1x	56	16-6	30680	13440	44120			
12		7	10	1000	4615	1½x	66	24-6	30090	15580	45670			
14		8	8	1000	23G	2x	72	21-6	47000	19880	66880			
14		8	12	1000	35G	2x	72	29-6	45000	21050	66050			
16		10	10	1000	9420	2x	84	25-8	62400	29470	91870			
16		10	14	1000	13180	2x	84	33-8	61600	32320	93920			

The capacities for the larger machines are all given in gallons.

†Without buffer safety valve.

Hydraulic Accumulators.

CONSTANT PRESSURE.

Design No.	Drawing No.	Diameter of Ram Inches	Stroke of Ram Feet	Working Pressure Pounds Per Square Inch	Capacity Cubic Inches	Size of Pipe	Floor Space Inches Square	Extreme Height Ram Up—Feet and Inches	Weight in Pounds			†Price \$		
									Weights Approximately	Other Parts	Total	Weights	Other Parts	Total
19		12	16	1000	94G	3xx	84	37-9	92800	38420	131220			
19	3403	12	8½	1000	50G	3xx	84	22-0	96000	31300	127300			
19	1044	12	12	1000	70½G	3xx	84	29-6	94800	34620	129420			
23	1722	14	20	1000	160G	3xx	96	47-3	121600	66420	188110			
23		15	15	1000	137G	3xx	96	37-3	145100	58600	203700			
23		15	20	1000	183G	3xx	96	47-3	142850	65530	208380			
28	2189	16	20	1000	208G	3xx	114	48-7	152820	90520	243340			
28		18	15	1000	198G	3x	114	38-7	211040	80350	291390			
28		18	20	1000	264 G	3x	114	48-7	204960	90240	295200			
33	3617	22	24	1000	474 G	6xx	122	57-5	303300	136540	444000			
7		4	4	1250	230	½x	30	10-11	5200	2310	7510			
7		2½	5	1250	290	½x	30	12-11	5200	2450	7650			
10		6	8	1250	1340	1x	56	15-10	18680	8780	27460			
10		6	8	1250	1790	1x	56	19-10	18680	9370	28050			
12		6	6	1250	2385	1½x	66	16-6	33630	13470	47100			
12		6	10	1250	3980	1½x	66	24-6	33040	15620	48660			
14		8	8	1250	4820	1½x	72	21-6	53600	19910	73510			
14		8	12	1250	7230	1½x	72	29-6	51600	21110	72710			
16		9½	10	1250	8060	1½x	84	25-8	68800	29520	98320			
16		9½	14	1250	11290	1½x	84	33-8	67200	32400	99600			
18		11	8	1250	9100	2x	84	22-1	102400	31730	134130			
18		11	12	1250	13640	2x	84	30-1	101600	35480	137080			
23		14	15	1250	120G	3xx	96	37-3	182150	58620	220750			
23		14	20	1250	160G	3xx	96	47-3	159900	65600	225500			
28		16	15	1250	156G	3xx	114	38-7	211120	80540	291660			
28		16	20	1250	208G	3xx	114	48-7	208000	90520	298520			
7		2½	4	1500	190	½x	30	10-11	5130	2310	7440			
7	2957A	2½	5	1500	235	½x	30	12-11	5130	2450	7590			
10		4½	6	1500	1145	1xx	56	15-10	19520	8790	28310			
10	2923	4½	6½	1500	1280	1x	56	17-2½	19100	9100	28200			
10		4½	8	1500	1525	1xx	56	19-10	19100	9390	28490			
12	2848	6	6	1500	2035	1½x	66	16-6	34220	13600	47720			
12	2848A	6	10	1500	3370	1½x	66	24-6	33630	15650	49280			
14		7½	8	1500	4240	1½x	72	21-6	55600	19950	75550			
14		7½	12	1500	6360	1½x	72	29-6	55600	21160	76760			
16		8½	10	1500	6810	2xx	84	25-8	70400	29560	99960			
16		8½	14	1500	9530	2xx	84	33-8	68800	32470	101270			
18		10	8	1500	7530	2xx	84	22-1	102400	31750	134150			
18		10	12	1500	11310	2xx	84	30-1	100800	35550	136350			

The capacities for the larger machines are all given in gallons.

†Without buffer safety valve.

Hydraulic Accumulators.

CONSTANT PRESSURE.

Design No.	Drawing No.	Diameter of Ram Inches	Stroke of Ram Feet	Working Pressure Pounds Per Square Inch	Capacity Cubic Inches	Size of Pipe	Flange Space Inches Square	Extreme Height Ram Up—Feet and Inches	Weight in Pounds			†Price \$		
									Weights Approximately	Other Parts	Total	Weights	Other Parts	Total
23		13	15	1500	1031G	3xx	96	37-3	170200	58650	228850			
23		13	20	1500	138G	3xx	96	47-3	167300	65670	232970			
28		15	15	1500	137G	3xx	114	38-7	226400	80640	307040			
28		15	20	1500	183G	3xx	114	48-7	223280	90660	313940			
7		4	5	1750	160	2x	30	10-11	5430	2310	7740			
7		4	5	1750	200	2x	30	12-11	5430	2450	7880			
10		4	6	1750	1020	1xx	56	15-10	20400	8800	29200			
10		4	8	1750	1360	1xx	56	19-10	20400	9410	29810			
12		5	6	1750	1710	1xx	66	16-6	33630	13520	47150			
12		5	10	1750	2850	1xx	66	24-6	33630	15660	49290			
14		5	8	1750	3690	1xx	72	21-6	57600	19980	77620			
14		5	12	1750	5540	1xx	72	29-6	55900	21220	77120			
16		8	10	1750	6030	2xx	84	25-8	73600	29590	103190			
16		8	14	1750	8440	2xx	84	33-8	72000	32520	104520			
18		9	8	1750	6800	2xx	84	21-1	108800	31760	140560			
18		9	12	1750	10200	2xx	84	30-1	108000	35580	143580			
23		12	15	1750	88G	3xx	96	37-3	170200	58680	228880			
23		12	20	1750	1171G	3xx	96	47-3	168900	65740	234640			
28		14	15	1750	120G	3xx	114	38-7	232480	80730	313210			
28		14	20	1750	160G	3xx	114	48-7	229440	90810	320250			
7		4	4	2000	150	2x	30	10-11	5430	2310	7740			
7		4	5	2000	185	2x	30	12-11	5430	2450	7890			
10	1178	6	6	2000	900	1xx	56	15-10	20820	8810	29630			
10		4	8	2000	1200	1xx	56	19-10	20820	9420	30240			
12		6	6	2000	1410	1xx	66	16-6	31860	13540	45400			
12		5	10	2000	2350	1xx	66	24-6	31270	15670	46940			
14		6	8	2000	3180	1xx	72	21-6	57900	20020	77920			
14		6	12	2000	4780	1xx	72	29-6	55900	21270	77170			
16		7	10	2000	5300	2xx	84	25-8	73600	29620	103220			
16		7	14	2000	7420	2xx	84	33-8	72800	32570	105370			
18		9	8	2000	6100	2xx	84	22-1	112800	31780	144580			
18		9	12	2000	9140	2xx	84	30-1	112200	35610	147810			
23		11	15	2000	731G	3xx	96	37-3	164400	58700	223100			
23		11	20	2000	981G	3xx	96	47-3	162150	65800	227950			
10		3	6	2250	690	1xx	56	15-10	17490	8820	26320			
10		3	8	2250	920	1xx	56	19-10	17380	9450	27830			
12	3311	4	6	2240	1275	1xx	66	16-6	31860	13550	45410			

The capacities for the larger machines are all given in gallons.

†Without buffer safety valve.

Hydraulic Accumulators.

CONSTANT PRESSURE.

Design No.	Drawing No.	Diameter of Ram Inches	Stroke of Ram Feet	Working Pressure Pounds Per Square Inch	Capacity Cubic Inches	Size of Pipe	Floor Space Inches Square	Extreme Height Ram Up—Feet and Inches	Weight in Pounds			†Price \$		
									Weights Approximately	Other Parts	Total	Weights	Other Parts	Total
12		4 $\frac{1}{2}$	10	2240	2125	1 $\frac{1}{2}$ xx	66	24-6	31860	15680	47540			
14		6	8	2250	2700	1 $\frac{1}{2}$ xx	72	21-6	53600	20050	73650			
14		6	12	2250	4060	1 $\frac{1}{2}$ xx	72	29-6	53600	21330	74930			
16		7 $\frac{1}{2}$	10	2250	3250	1 $\frac{1}{2}$ xx	84	25-8	78400	29650	108050			
16		7 $\frac{1}{2}$	14	2250	7350	1 $\frac{1}{2}$ xx	84	33-8	77600	32600	110200			
18		8 $\frac{1}{2}$	8	2250	5440	2 $\frac{1}{2}$ xx	84	22-1	112800	31790	144590			
18		8 $\frac{1}{2}$	15	2250	8170	2 $\frac{1}{2}$ xx	84	30-1	112200	35640	147840			
23		10 $\frac{1}{2}$	15	2250	67G	3 $\frac{1}{2}$ xx	96	37-3	169550	58720	228270			
23		10 $\frac{1}{2}$	20	2250	90G	3 $\frac{1}{2}$ xx	96	47-3	167300	65870	233170			
10		3 $\frac{1}{2}$	6	2500	595	1 $\frac{1}{2}$ xx	56	15-10	16550	8840	25390			
10		3 $\frac{1}{2}$	8	2500	795	1 $\frac{1}{2}$ xx	56	19-10	16130	9470	25600			
12		4 $\frac{1}{2}$	6	2500	1145	1 $\frac{1}{2}$ xx	66	16-6	32450	13570	46020			
12		4 $\frac{1}{2}$	10	2500	1908	1 $\frac{1}{2}$ xx	66	24-6	31860	15700	47580			
14		5	8	2500	2280	1 $\frac{1}{2}$ xx	72	21-6	49300	20090	69390			
14		5	12	2500	3420	1 $\frac{1}{2}$ xx	72	29-6	49300	21380	70680			
16		6 $\frac{1}{2}$	10	2500	4290	1 $\frac{1}{2}$ xx	84	25-8	75200	29670	104870			
16		6 $\frac{1}{2}$	14	2500	6000	1 $\frac{1}{2}$ xx	84	33-8	74400	32650	107050			
18		8	8	2500	4830	1 $\frac{1}{2}$ xx	84	22-1	111200	31810	143010			
18	3074A	8	10	2500	6030	1 $\frac{1}{2}$ xx	84	26-1	112000	33770	145770			
18		8	12	2500	7230	1 $\frac{1}{2}$ xx	84	30-1	110400	35670	146070			
23		10	15	2500	61G	2 $\frac{1}{2}$ xx	96	37-3	171150	58750	229900			
23		10	20	2500	81G	2 $\frac{1}{2}$ xx	96	47-3	169550	65940	135490			
10		2 $\frac{1}{2}$	6	3000	350	1 $\frac{1}{2}$ xx	56	13-10	14000	8610	22610			
10		2 $\frac{1}{2}$	6	3000	425	1 $\frac{1}{2}$ xx	56	15-10	14000	8910	22910			
12		4	6	3000	904	1 $\frac{1}{2}$ xx	66	16-6	30680	13580	44260			
12		4	10	3000	1505	1 $\frac{1}{2}$ xx	66	24-6	30090	15730	45820			
14		5	8	3000	1880	1 $\frac{1}{2}$ xx	72	21-6	49300	20120	69420			
14		5	12	3000	2820	1 $\frac{1}{2}$ xx	72	29-6	49300	21440	70740			
16	1218	6	10	3000	3380	1 $\frac{1}{2}$ xx	84	25-8	71200	29710	100910			
16		6	14	3000	4740	1 $\frac{1}{2}$ xx	84	33-8	70400	32720	103120			
18		8	8	3000	3680	1 $\frac{1}{2}$ xx	84	22-1	101600	31830	133430			
18		7	12	3000	5520	1 $\frac{1}{2}$ xx	84	30-1	100800	35740	136540			
10		2 $\frac{1}{2}$	5	3500	290	1 $\frac{1}{2}$ xx	56	13-10	13170	8620	21790			
10		2 $\frac{1}{2}$	6	3500	350	1 $\frac{1}{2}$ xx	56	15-10	13170	8920	22090			
12		3 $\frac{1}{2}$	6	3500	690	1 $\frac{1}{2}$ xx	66	16-6	26550	13600	40150			
12		3 $\frac{1}{2}$	10	3500	1155	1 $\frac{1}{2}$ xx	66	24-6	25590	15770	41360			
14		4 $\frac{1}{2}$	8	3500	1520	1 $\frac{1}{2}$ xx	72	21-6	46700	20160	66860			

The capacities for the larger machines are all given in gallons.

†Without buffer safety valve.

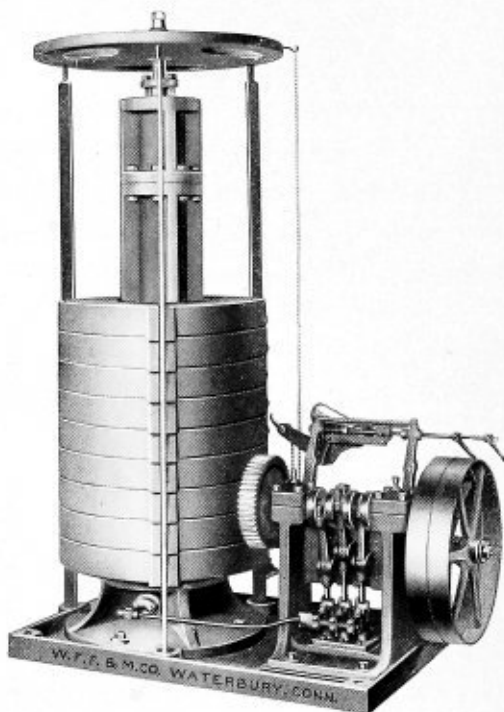
Hydraulic Accumulators.

CONSTANT PRESSURE.

Design No.	Drawing No.	Diameter of Ram Inches	Stroke of Ram Feet	Working Pressure Pounds Per Square Inch	Capacity Cubic Inches	Size of Pipe	Floor Space Inches Square	Extreme Height Ram Up—Feet and Inches	Weight in Pounds			Price \$		
									Weights Approximately	Other Parts	Total	Weights	Other Parts	Total
14		4½	12	3500	2280	1½xx	72	29-6	46700	21500	68200			
16		5½	10	3500	2600	1½xx	84	25-8	62400	29760	92160			
16		5½	14	3500	3640	1½xx	84	33-8	61600	32800	94400			
18		6½	8	3500	3180	1½xx	84	22-1	102400	31840	134240			
18		6½	12	3500	4770	1½xx	84	30-1	101600	35770	137370			
10		2	5	4000	185	¾xx	56	13-10	8490	8640	17130			
10		2	6	4000	225	¾xx	56	15-10	8490	8940	17430			
12		3	6	4000	505	1xx	66	16-6	21240	13610	34850			
12		3	10	4000	845	1xx	66	24-6	21240	15820	37060			
14		4	8	4000	1200	1½xx	72	21-6	40700	20190	60890			
14		4	12	4000	1800	1½xx	72	29-6	40700	21560	62260			
16		4½	10	4000	1910	1½xx	84	25-8	50400	29800	80200			
16		4½	14	4000	2670	1½xx	84	33-8	49600	32870	82470			
18	3073	6	8	4000	2710	1½xx	84	22-1	100000	31860	131860			
18		6	12	4000	4070	1½xx	84	30-1	99200	35800	135000			
12		2½	6	4500	425	¾xx	66	16-6	19470	13620	33090			
12		2½	10	4500	710	¾xx	66	24-6	19470	15880	35350			
14	1541	2½	5	4500	375	¾xx	56	13-10	24150	8700	32850			
14		3½	8	4500	920	1xx	72	21-6	34400	20230	54630			
14		3½	12	4500	1380	1xx	72	29-6	34100	21620	55720			
16		4	10	4500	1510	1½xx	84	25-8	43200	29830	73030			
16		4	14	4500	2110	1½xx	84	33-8	43200	32920	76120			
12		2½	4	5000	210	¾xx	66	12-6	15340	12690	28030			
12		2½	6	5000	315	¾xx	66	16-6	15340	13630	28970			
16		3½	6	5000	690	1xx	84	17-8	35200	26740	61940			
16		3½	10	5000	1155	1xx	84	25-8	35200	29860	65060			
16		3	6	5500	510	1xx	84	17-8	26400	26750	53150			
16		3	10	5500	850	1xx	84	25-8	25600	29890	55490			

The capacities for the larger machines are all given in gallons.

†Without buffer safety valve.



VARIABLE PRESSURE.

WEIGHT CONTROL.

1954
1000 Inch by 5 feet by 2000 pounds Accumulator (2075)
Mounted with No. 2 Geared Triplex Pump.

Hydraulic Accumulators

VARIABLE PRESSURE.

The illustrations on pages 104 and 109 H show variable pressure accumulators which are used chiefly for testing water pipes and tubes. These machines differ from those described on pages 98 to 103 H in the weights themselves and in the rods that the weights hang from. Variable weights are in one piece forming a ring; on the outer edges are cast lugs which engage with pins passing through holes in the weight rods. By shifting the pins from one set of holes in the rods to another, the number of weights lifted and consequently the working pressure can be changed. Nos. 2075, 1366 A, 2727, 3193, 2430 are so designed that the changes of pressure are by steps of approximately one tenth the maximum pressure. No. 3202 can have its pressure varied by steps of about 95 pounds.

Notice that the variable pressure machines have long weight rods which pass through holes in the base plate; also that pipes must be inserted in the foundation under these holes to allow free passage of the weight rods.

Weights and prices on the next page apply to the accumulator itself, not to the accumulator and pump mounted together. Weights and prices for this combination are on page 113 H.

Hydraulic Accumulators.

VARIABLE PRESSURE.

Design No.	Drawing No.	Diameter of Ram Inches	Stroke Feet	Maximum Pressure Pounds Per Square Inch	Capacity Cubic Inches	Size of Pipe	Floor Space Inches Square	Extreme Height, Ram Up—Feet and Inches	Weight in Pounds			†Price \$			
									Weights Approximately	Other Parts	Total	Weights	Other Parts	Total	
7	2075	1954													
7	1366A	1000	5	2000	180	4"X	36½	12-2½	5400	2060	7460				
7	2727		5	1500	114	3"X	36½	10-0½	4050	2200	6250				
10	2430		5	1580	240	3"X	36½	10-0	5600	2400	8000				
10	3193		6	2000	690	3"X	68½	16-1	15600	8890	24490				
23	3202		6	1000	1413	1½"X	68½	16-1	15600	8820	24420				
		13	20	1500	137G	3"X	114	47-6	167200	72750	239950				

†Without buffer safety valve.

Hydraulic Accumulators

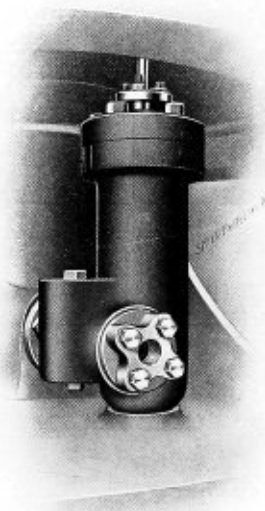
VARIABLE PRESSURE.

If a constant pressure machine listed on pages 98 to 103 H is to be made over to variable pressure the table below will indicate approximately the change in weight and price due to the alteration. Not all of the design numbers are included in this table, however, only those which we can readily convert. Note that variable weights are machine finished in part.

Design No.	Stroke Feet	Floor Space Inches Square	Change of Weight in Pounds		† Change of Price \$	
			Weights Approximately	Other Parts	Weights	Other Parts
7	4	36½	0	- 315	+	+
7	6	36½	0	- 275	+	+
10 or 10¾	6	68½	0	+ 60	+	+
10 or 10¾	8	68½	0	+ 100	+	+
12 or 13	6	78	0	+ 850	+	+
12 or 13	10	78	0	+ 950	+	+
12 or 13	16	78	0	+1100	+	+
14	8	86	0	+1720	+	+
14	12	86	0	+1840	+	+
16, 18 or 19	8	100	0	+3200	+	+
16, 18 or 19	12	100	0	+3400	+	+
16, 18 or 19	16	100	0	+3600	+	+
23	15	114	0	+5650	+	+
23	20	114	0	+6000	+	+

+ Add this amount to that taken from the constant pressure table to get the amount suitable for variable pressure.

- Subtract this amount, etc. †Without buffer safety valve.



Buffer Safety Valve for No. 1218

6 1/2 IN. BY 10 FT. BY 3000 LB. ACCUMULATOR.

The valve shown in the cut is a **safety device** which can be adapted to any large accumulator. The principle used is that of throttling the exit from the accumulator by gradually and automatically closing a valve in the pipe leading out of it, this taking place when the weights come to the bottom of the stroke. Should a break take the pressure off from the piping system fed by the accumulator and the latter fall freely it would deliver a heavy and destructive blow to the base and foundation. To prevent this, the use of our valve sets up an excess back pressure, due to the close of the throttle valve, which acts on the ram and brings it to rest slowly. In addition to the throttle valve, a check valve in the same casting affords an inlet to the accumulator at all times. Valves of this type have been fitted to accumulators 1218, 1722, 2189, 3073, 3074, 3202, 3403 and 3617.

Up to and including 3 inch pipe, price, extra, \$

For 4, 5 and 6 inch pipe, price, extra, \$

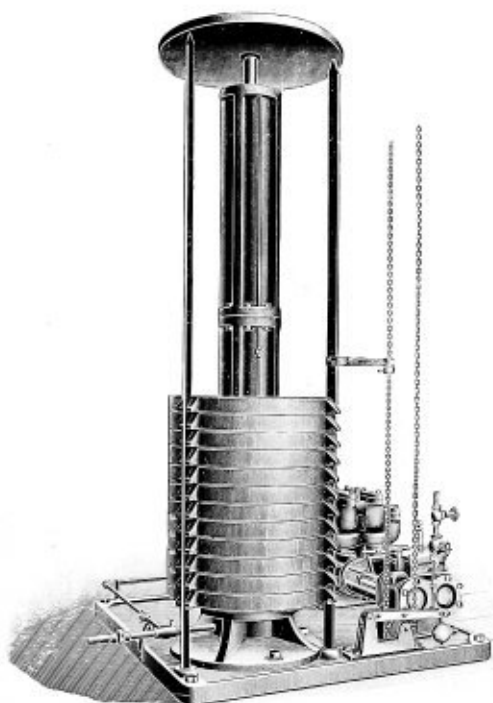
Special Hydraulic Accumulator (3053)

1 3-8 IN. BY 25 IN. BY 8000 POUNDS.

The construction of this machine is somewhat different from our standard accumulators inasmuch as the **cylinder is of forged steel** in one piece, secured to the cast iron base by a nut and having a shoulder at its upper end for limiting the stroke of the weight ring; the weights are cast iron of the cheese type; the plunger is movable and is made of tobin bronze packed with flax held in place by a bronze gland screwed into the cylinder; the weight ring is of cast iron as is the bonnet and these two parts are connected by steel rods; an arm is provided at the top of the ram. Photo 1120 shows the accumulator.

Diameter of ram, 1 3/4 inches; stroke, 25 inches; working pressure, 8000 pounds per square inch; capacity, 37 cubic inches; outlet, 1/2 xx pipe; floor space, 40 inches square; extreme height with ram up, 8 feet.

Weights, 10000 pounds.	Price, \$
Other parts, 3200 pounds.	Price, \$
Complete, 13200 pounds.	Price, \$



Hydraulic Accumulator and Steam Pump (2727)

VARIABLE PRESSURE.

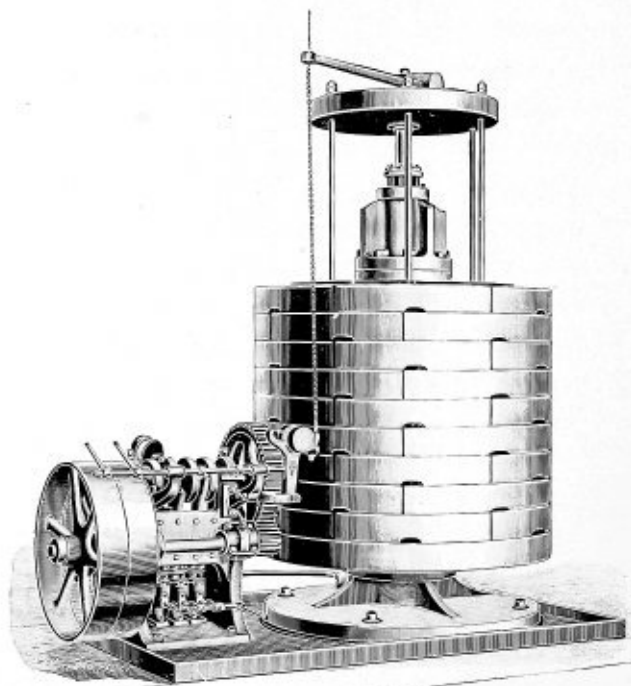
STEAM CONTROL.

The cut above shows an accumulator, tank, steam pump and controlling mechanism mounted on a base plate. The design is such that the steam supply is shut off automatically when the accumulator is full and opened again when the ram is nearly down. For information about accumulators and belt driven pumps mounted together see page 112 H, while a general description of our accumulators will be found on page 95 H. Capacity of pump, about 600 cubic inches per minute; size, $5\frac{1}{4}$ by 1 by 5 inches, 75 ft. per minute piston speed; steam pressure about 75 pounds. No. 2727 has a ram $2\frac{1}{4}$ inches diameter, 5 feet stroke and will work up to 1580 pounds per square inch pressure; capacity, 238 cubic inches; pipe, $\frac{3}{4}$ inch double extra; floor space, 64 by 66 inches; extreme height, 15 feet 3 inches.

Weights, 5600 pounds. Price, \$.....

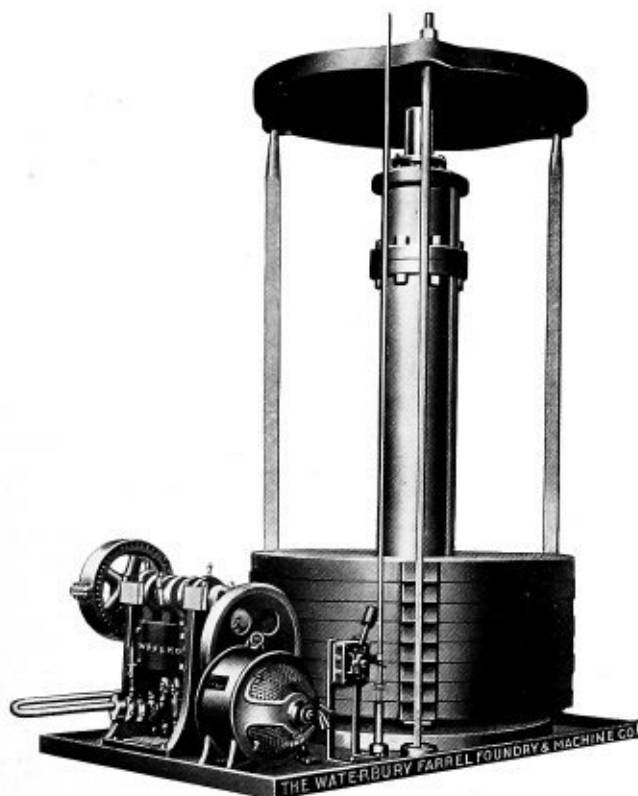
Other parts, 4700 pounds. Price, \$.....

Total, 11400 pounds, inclusive of pump. Price, \$.....



2 13-16 Inch by 5 Ft. by 4500 Lb. Accumulator (1541)
CONSTANT PRESSURE. **WEIGHT CONTROL.**
 Mounted with No. 8 Geared Triplex Pump.

The illustration shows an accumulator and geared power pump mounted together on a base plate and provided with piping for connecting the two, also an automatic belt shipper for starting and stopping the pump. If the accumulator fills and rises to its extreme top position, the arm strikes a dog on the chain running through it and pulls the chain, causing the shipper to move the belt to the loose pulley, thus stopping the pump. As the water is drawn off, the falling weight ring hits a pin and the belt shipper starts the pump again. A similar device is shown on page 104 H. Weights and prices are on page 113 H.



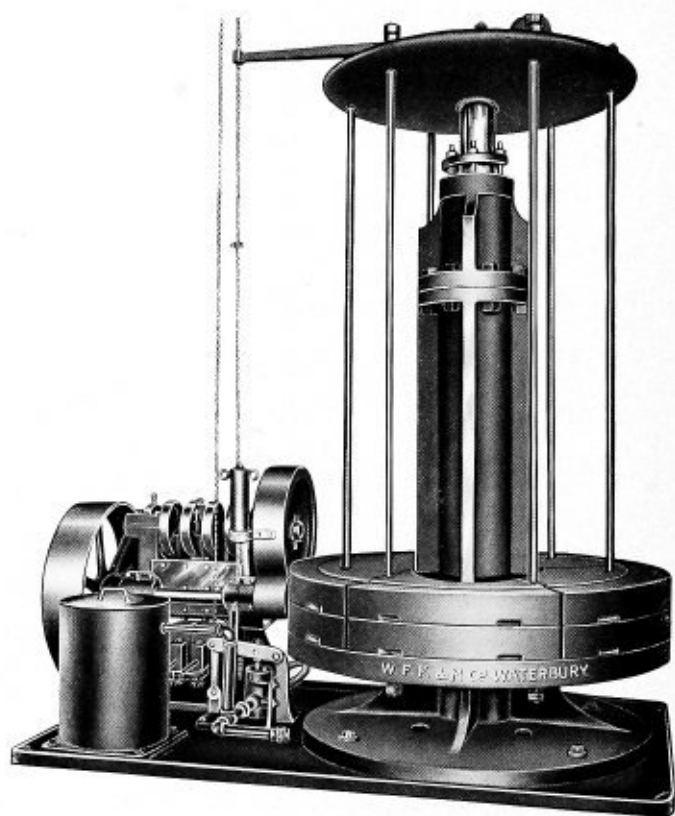
5 Inch by 6 Ft. by 1000 Lb. Accumulator (3193)

VARIABLE PRESSURE.

ELECTRIC CONTROL.

Mounted with No. 5 Geared Triplex Pump.

The cut shows a motor driven pump discharging into an accumulator and all piping parts for connecting the two are furnished. The **operating device** for stopping the pump when the accumulator is full and starting it again after a part of the stored water is withdrawn is also furnished. It consists of a self-starting rheostat with a solenoid switch controlled by the small switch shown above. As the ram reaches the top of the stroke the current is turned off from the motor. When the ram falls again the motor starts up under load, its action being controlled by the self starter. Photo 1202 shows the same machine without the motor, the pump being belt-driven with weight control. Weights and prices are on page 113 H.



6 Inch by 6 Foot by 1500 Lb. Accumulator (2848)

CONSTANT PRESSURE.

VALVE CONTROL.

Mounted with No. 15 Geared Triplex Pump.

6 Inch by 6 Foot Accumulator with Geared Triplex Pump 1500 POUNDS PER SQUARE INCH PRESSURE.

This illustration shows an accumulator, pump, bypass and check valves mounted together on a base and provided with piping for connecting the machines. The water coming from the pump passes through the check valve into the accumulator, and raises the ram until the arm on top strikes a dog on the chain and opens the bypass, thereby stopping the accumulator in its ascent. As soon as the water is drawn off by the machines on the system the accumulator gradually descends until the arm on top goes down sufficiently to allow a weight on the chain to close the bypass valve and thus stop the accumulator, which is ready to ascend again. The pump runs constantly and takes full power only when pumping into the accumulator; when running idle the power required is nominal. The tank shown is 17 inches in diameter and 23 inches high inside measurements.

ACCUMULATOR AND BASE (2848)		NO. 15 PUMP (2849)	
Diameter of ram..... inches	6	Diameter of plungers..... inches	2
Stroke of ram..... "	72	Stroke..... "	6
Maximum pressure... lbs. per sq. in.	1500	Ratio of gearing.....	4 1-13 to 1
Capacity..... cu. ins.	2035	Diam. and face of pulley...	36 by 8
Size of pipe..... inches	1 1/4 x	Speed of pulley..... R. P. M.	250
Floor space..... "	113 by 66	Delivery, about.....	3200
Extreme height, ram up....	16 ft. 7 1/4 in.	cubic inches per minute	
Weight of accumulator....	pounds 13500	Weight of pump.....	pounds 2400
Weight of weights..... "	34220	Weight of base and valve... "	3200
Total weight..... pounds, 53320.			
Price, complete as shown, except weights for accumulator.....			\$.....
Price of weights for accumulator, extra.....			\$.....

Constant or Variable Pressure Accumulators

Mounted with Geared Triplex Power Pumps

We are prepared to build small power plants for **furnishing water under pressure** for manufacturing purposes where the demand is for a device that will furnish a supply at a certain constant pressure in any desired quantity (up to a predetermined maximum) at any time. Service such as this is called for where several hydraulic machines derive power from one source. These small plants consist of a pump and an accumulator mounted on a base plate and provided with a suitable controlling device. The accumulator serves as a pressure regulator and actuates the controlling device; it serves as a reservoir only when sudden but infrequent demands for water are to be provided for. All these plants are **self-regulating** as regards consumption of power, the controlling devices being such that when the accumulator is full there is practically no power required to keep the pump running and yet if water under pressure is drawn from the system the full capacity of the pump is made available automatically; at once in the case of the electric control, at any desired time during the fall of the accumulator in the case of the valve control and near the bottom of the stroke in the case of the weight control.

To select a suitable pump and accumulator to mount together the working pressure in pounds per square inch and the average demand for water in cubic inches per minute should be ascertained. Then select from the tables of capacities given on pages 119, 121, 122 and 123 H the size pump that at the given pressure will deliver as much or more than the required amount. Then divide the capacity at the given pressure of the pump selected by a sum which will vary from 360 in the case of an accumulator with 4 foot stroke to 720 in the case of a 10 foot stroke and the quotient will be the area in square inches of the smallest ram that should be used in the accumulator. Now turn this area into the diameter corresponding and with this ram diameter and the working pressure in mind consult the tables on pages 98 to 103 H and select a suitable accumulator. Each machine in that list has a design number and with that number and the number of the pump given the cost of mounting can be found from the opposite page. In selecting a suitable stroke for the accumulator allow enough stroke to provide whatever storage capacity the machine should have, basing this on the supposition that a majority of the machines on the system may take water simultaneously.

Weights and prices below are for the **mounting only** and do not include the weights and prices of the accumulators (see pages 98 to 103 H and page 105 H) or of the pumps (see pages 118 to 123 H).

For the mounting with **weight control** as illustrated on pages 104 and 108 H the items included in the weights and prices below are as follows: one base plate, anchor bolts and plates, vertical chain and dogs, the mechanism on the pump for actuating the belt shipper, the piping between pump and accumulator. In selecting the price for the pump note that the pump should have tight and loose pulleys, base or tank.

For the mounting with **valve control** as illustrated on page 110 H the items included in the weights and prices below are as follows: one base plate, anchor bolts and plates, vertical chain with dogs and extra sprocket to be attached to roof, bypass and check valves, the mechanism for operating these valves, the piping between the pump and accumulator. Note that the pump does not require tight and loose pulley, base or tank.

For the mounting with **electric control** as illustrated on page 109 H the items included in the weights and prices below are as follows: one base plate, anchor bolts and plates, vertical rod and dogs, the piping between pump and accumulator, the float switch. Note that the price of the pump should include motor, line switch and fuses, self-starter and solenoid switch but no base or tank.

For mounting together Pump and Accumulator	Method of Control		
	Weight	Valve	Electric
Pump No. 2 (page 123 H) and Design No. 7	850 lbs.	—	900 lbs.
" 5 " 122 H " 7	\$ 900 lbs.	—	\$ 1000 lbs.
" 8 " 121 H " 7	\$ 1600 lbs.	1800 lbs.	\$ 1700 lbs.
" 5 " 122 H " 10 or 10½	\$ 2000 lbs.	\$ 2200 lbs.	\$ 2100 lbs.
" 8 " 121 H " 10 or 10½	\$ 2000 lbs.	\$ 2200 lbs.	\$ 2100 lbs.
" 15 " 119 H " 10 or 10½	—	\$ 3200 lbs.	\$ 3940 lbs.
" 5 " 122 H " 12 or 13	2000 lbs.	\$ 2200 lbs.	\$ 2100 lbs.
" 8 " 121 H " 12 or 13	\$ 3000 lbs.	\$ 3200 lbs.	\$ 3940 lbs.
" 15 " 119 H " 12 or 13	—	\$ 3200 lbs.	\$ 3940 lbs.
" 8 " 121 H " 14	—	\$ 3200 lbs.	\$ 3940 lbs.
" 15 " 119 H " 14	—	\$ 3200 lbs.	\$ 3940 lbs.

All prices in this table include a cast iron tank 17 inches diameter and 23 inches high inside measurement with cover. With variable weight accumulators used for testing however, it is not needed and 200 pounds and \$..... will be deducted from the prices above.

Hydraulic Accumulators and Triplex Pumps.

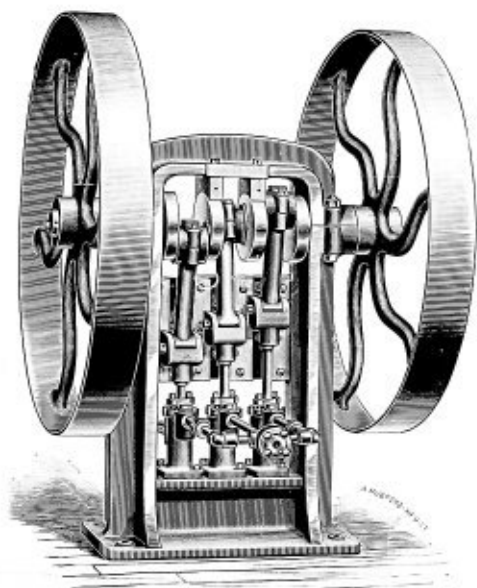
MOUNTED TOGETHER.

Accum. No.	Cap. cubic inches.	Page.	Pump No.	Cap. cu. in. min.	Page.	Floor space, inches.	Pressure lbs. per sq. in.	Weight, lbs.	Method of Control.	Price, complete \$
1366 B	185	98 H	1366 D	160	125 H	60 x 35	350	3760	Weight	.....
1665 B	420	99 H	1665	342	123 H	63 x 35	1000	9300	Weight	.....
3193	1413	105 H	3023	1060‡	122 H	100 x 70	1000	27340	Weight	.....
3193 A	1413	105 H	3023	1060‡	122 H	102 x 60	1000	28260	Elec.	*
1366 A	114	105 H	1366	96	125 H	60 x 35	1500	7210	Weight	.....
2923	1280	100 H	1540	1880	120 H	102 x 68	1500	32325	Valve	.....
2848	2035	100 H	2849	3290	118 H	113 x 66	1500	53320	Valve	.....
2075	180	105 H	1665	342	123 H	66 x 35	2000	8700	Weight	.....
1665 A	420	98 H	1665	342	123 H	63 x 35	2000	10080	Weight	.....
2957	235	100 H	1540	1310	120 H	72 x 61	2000	13000	Valve	.....
3311	1275	101 H	2747	1620†	118 H	138 x 67	2240	54745	Valve	*
1541	375	103 H	1540	410	120 H	105 x 60	4500	36060	Weight	.....

*Including motor and its starting devices.

†@ 40 R. P. M.

§@ 60 R. P. M.



Triplex Power Pump (791)

We build this pump for lighter service than that required of the pumps listed on page 117 H. It is of a similar design but the construction is simpler and the tank base is not provided. It is a superior machine of the best materials, well fitted and equal to any pump of its class in the market. Stroke, 5 inches; pulleys, 48 inches diameter by $5\frac{1}{2}$ inches face; distance from center to center of pulleys, $34\frac{1}{2}$ inches; bottom of base to center of shaft, 37 inches; speed of pulleys, 80 revolutions per minute; floor space required, 41 by 48 inches; size of outlet pipe, $\frac{1}{2}$ x; diameter of plungers, $1\frac{1}{8}$ inches; working pressure, 4000 pounds per square inch; capacity, 1130 cubic inches per minute.

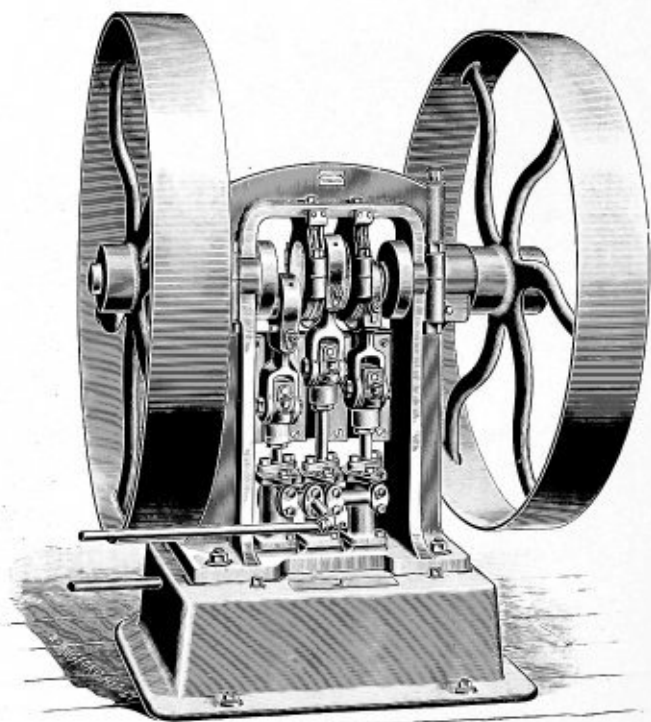
Weight, 1800 pounds. Price, \$.....

Pump No. 810 A has plungers $1\frac{3}{4}$ inches diameter; one pair tight and loose pulleys, 30 by $4\frac{1}{2}$ inches; outlet pipe, 1 inch common; working pressure, 400 pounds per square inch; capacity, 2740 cubic inches per minute. Otherwise it is like No. 791.

Weight, 1820 pounds. Price, \$.....

Pump No. 953 has plungers 1 inch diameter; two pulleys, 54 by 6 inches; outlet pipe, $\frac{3}{4}$ x; working pressure, 6000 pounds per square inch; capacity, 895 cubic inches per minute. Otherwise it is like No. 791.

Weight, 1850 pounds. Price, \$.....



Triplex Power Pump (977)

In giving the capacities of all pumps in this catalogue, we have allowed **five per cent. slip**. The rated capacity is therefore but ninety-five per cent. of the theoretical capacity worked out from the diameter, stroke, and speed of the plungers. This rated capacity is approximate.

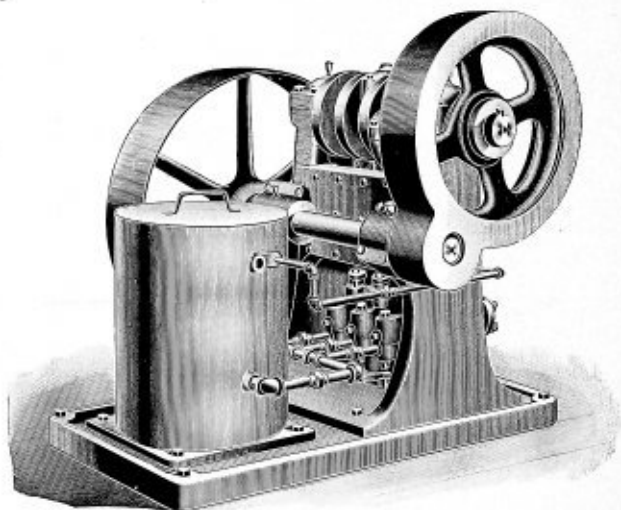
Triplex Power Pumps.

The illustration shows an efficient pump designed for operating hydraulic machinery under heavy pressure. It is shown on page 8 H connected to an embossing press and on page 68 H to a vertical drawing press. As indicated below, we make this pump for different pressures, the size of the plungers increasing as the pressure decreases. The driving shaft and connecting rods are provided with adjustments for taking up any wear that may occur, as well as with provision for oiling. The connecting rods are steel with bronze boxes, while the crosshead pins are hardened steel. The plungers are also steel, hardened and ground, packed with square flax packing. The pump barrels and valves are of the best phosphor bronze and are carefully fitted. Stroke, 5 inches; pulleys, 54 inches diameter by $7\frac{1}{2}$ inches face (except No. 1010 has 9 inches face); distance from center to center of pulleys, 39 inches; bottom of base to center of shaft, $42\frac{3}{4}$ inches; speed of pulleys, 60 revolutions per minute; floor space required, 49 by 54 inches; size of outlet pipe, 1 inch xx. The base of the pump is used as a tank.



SPECIFICATIONS.

Number of Machine	977	977 B	977 A	1010	1344 A
Diameter of plungers..... inches	1	$1\frac{1}{8}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
Working pressure...lbs. per sq. in.	8000	6000	5500	4000	2100
Capacity.....cu. ins. per min.	680	760	950	1420	2520
Weight..... pounds	2830	2870	2875	2950	2980
Price..... \$	.....	.....	.....	.....	.....



No. 15 Geared Triplex Power Pump (2747)

1 13-16 BY 6 INCH CYLINDERS.

This pump is similar to those described and listed on page 120 H. The principal dimensions are as follows: There are three plungers, each $1\frac{1}{8}$ inches diameter, 6 inches stroke, working up to a pressure of 2000 pounds per square inch; ratio of gearing, 4 1-13 to 1; driving pulley, 36 by 8 inches, 250 revolutions per minute; size of discharge pipe, $1\frac{1}{4}$ inch xx; delivery, 2705 cubic inches per minute; floor space, 55 by 44 inches; extreme height, $49\frac{1}{4}$ inches. Tight and loose pulleys can be furnished if desired. Pump 2849 is No. 2747 with 2 inch plungers; capacity, 3290 cubic inches per minute; working pressure, 1500 pounds per square inch. The tank is 17 inches diameter, 23 inches high. See also photo 869.

Weight with tank and base 3,300 pounds.	Price, \$
Weight without tank and base, 2400 pounds.	Price, \$
Tight and loose pulleys, extra, 260 pounds.	Price, \$
Westinghouse Type S motor, extra.	Price, \$
(When mounted on same base as pump).	
Westinghouse Type S motor, extra.	Price, \$
(Including self starter, etc. for accumulator service).	

No. 15 Geared Triplex Power Pump.

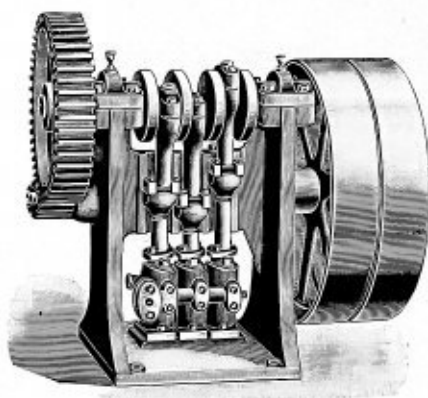
The pump shown on the opposite page can be altered so as to deliver water at pressures other than those mentioned in the descriptive matter. To do this the plunger diameter is changed. For instance, if the working pressure in pounds per square inch is decreased, the full power required for the pump remaining constant, we can increase the capacity by enlarging the diameter of the plungers. The table below shows the different sizes of plungers that can be used with this pump.

All data given opposite remains the same except that the discharge pipe size increases with the size of plungers. Diameters are in inches; pressures in pounds per square inch; capacities are approximate and are in cubic inches per minute.

CAPACITIES OF NO. 15 PUMP.

Diam.	Press.	Cap.	Diam.	Press.	Cap.	Diam.	Press.	Cap.
$\frac{7}{8}$	8500	630	$1\frac{1}{2}$	2900	1850	$2\frac{1}{8}$	1450	3720
$\frac{9}{16}$	7450	725	$1\frac{5}{16}$	2680	2010	$2\frac{3}{16}$	1360	3940
1	6550	820	$1\frac{3}{8}$	2480	2170	$2\frac{1}{4}$	1300	4180
$1\frac{1}{16}$	5800	930	$1\frac{9}{16}$	2300	2440	$2\frac{5}{16}$	1220	4400
$1\frac{3}{8}$	5200	1040	$1\frac{3}{4}$	2100	2520	$2\frac{3}{8}$	1160	4640
$1\frac{5}{16}$	4650	1160	$1\frac{11}{16}$	1980	2700	$2\frac{7}{16}$	1100	4880
$1\frac{1}{4}$	4200	1285	$1\frac{7}{8}$	1850	2890	$2\frac{1}{2}$	1050	5140
$1\frac{5}{16}$	3800	1420	$1\frac{13}{16}$	1740	3090	$2\frac{9}{16}$	1000	5400
$1\frac{3}{8}$	3450	1555	2	1630	3290	$2\frac{5}{8}$	950	5670
$1\frac{7}{16}$	3160	1700	$2\frac{1}{16}$	1540	3500	—	—	—

Prices and weights are the same for all capacities and are given opposite. It requires 15 horse power to run this pump at the speed given.



No. 8 Geared Triplex Power Pump (1668 A)

1 15-16 BY 4 INCH CYLINDERS.

The cut above shows the next to the largest size of this class of pump. The same size is shown again on page 108 H. If mounted with an accumulator the automatic belt shipper is attached, otherwise a hand belt shipper is furnished. These pumps have cut gears, forged steel cranks, bronze cylinders and valves, and either tool steel plungers, hardened and ground, or tobin bronze plungers. The shaft bearings are babbitted and well provided with facilities for oiling. Unless ordered otherwise a single pulley is substituted for the tight and loose pulleys.

The pump has three plungers each $1\frac{3}{8}$ inches diameter and 4 inches stroke, working against a pressure of 1420 pounds per square inch; the delivery is about 2010 cubic inches per minute; ratio of gearing, 4 1-12 to one; diameter and face of pulley, 30 by $5\frac{1}{4}$ inches; speed, 245 revolutions per minute; discharge pipe, $\frac{3}{4}$ x; floor space, 44 by 32 inches; extreme height, 40 inches.

Weight with tank and base, 2200 pounds.	Price, \$
Weight without tank and base, 1500 pounds.	Price, \$
Tight and loose pulleys, extra.	Price, \$
Westinghouse type S motor, extra.	Price, \$
(When mounted on same base as pump.)	
Westinghouse Type S motor, extra.	Price, \$
(Including self starter, etc., for accumulator service.)	

No. 8 Geared Triplex Power Pump.

No. 8 Geared Triplex Pump, No. 3054, is the same as No. 1668 A except in the method of holding the crossheads. The crossheads of No. 3054 are held as shown in the cut on page 109 H.

The pump shown on the opposite page can be changed so as to deliver water at the various pressures and in the different quantities given in the table below. In order to do this a change is made in the diameter of the plungers, the larger the plunger used the greater the capacity but the lower the working pressure. By suitably proportioning the plungers the full power required to drive the pump remains constant for every size.

All data given opposite remains the same for each size of plunger except that a smaller pipe is used with the smaller plungers. In the table below diameters are in inches; pressure in pounds per square inch; capacities are approximate and are in cubic inches per minute.

CAPACITIES OF NO. 8 PUMP.

Diam.	Press.	Cap.	Diam.	Press.	Cap.	Diam.	Press.	Cap.
$\frac{3}{8}$	7900	350	—	—	—	$1\frac{5}{8}$	2000	1410
$\frac{7}{8}$	7000	410	$1\frac{1}{4}$	3400	840	$1\frac{9}{16}$	1870	1520
$1\frac{5}{16}$	6100	470	$1\frac{5}{8}$	3100	920	$1\frac{3}{4}$	1750	1640
1	5200	535	$1\frac{3}{8}$	2800	1010	$1\frac{13}{16}$	1620	1760
$1\frac{1}{16}$	4700	605	$1\frac{7}{8}$	2580	1100	$1\frac{7}{8}$	1500	1880
$1\frac{1}{8}$	4200	675	$1\frac{1}{2}$	2400	1200	$1\frac{5}{8}$	1420	2010
$1\frac{3}{8}$	3800	750	$1\frac{5}{8}$	2180	1310	2	1330	2140

Prices and weights are the same for all capacities and are given opposite. It requires 8 horsepower to drive this pump at the speed given.

No. 5 Geared Triplex Power Pump (3023)

This machine is similar to the pump described on the preceding page and is fitted with cut gears, forged steel crank shaft, bronze cylinders and an iron frame. Both shaft bearings are babbitted. It will pump 659 cubic inches of water per minute against 2550 pounds per square inch pressure with $1\frac{3}{8}$ inch plungers; stroke, 3 inches; each plunger makes 70 strokes per minute; ratio of gearing, 3 7-10 to one; driving pulley, 24 by $4\frac{1}{4}$ inches, 460 revolutions per minute; floor space, 40 by 27 inches; extreme height, 36 inches.

Weight with tank and base plate, 1700 pounds.	Price, \$.....
Weight without tank and base plate, 1100 pounds.	Price, \$.....
Tight and loose pulleys, extra.	Price, \$.....
Westinghouse Type S motor, extra.	Price, \$.....
(When mounted on same base as pump).	
Westinghouse Type S motor, extra.	Price, \$.....
(Including self starter, etc., for accumulator service).	

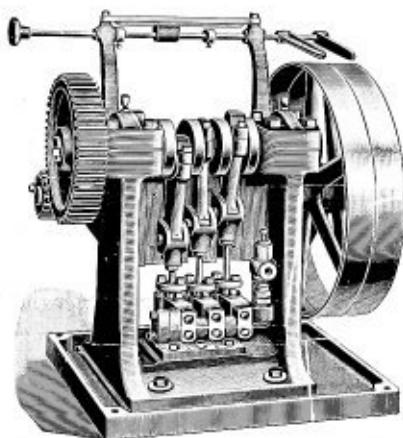


Changes for using different sizes of plungers in this pump give us the various pressures and capacities listed below. The power required to drive the pump is kept constant throughout. All data given above remains the same for all sizes of plungers; the figures that vary being given below; plunger diameters are in inches; pressures in pounds per square inch; capacities are approximate and are given in cubic inches per minute.

CAPACITIES OF NO. 5 PUMP.

Diam.	Press.	Cap.	Diam.	Press.	Cap.	Diam.	Press.	Cap.
$\frac{1}{8}$	7550	221	1	3550	466	$1\frac{1}{8}$	2050	805
$\frac{3}{4}$	6350	262	$1\frac{1}{16}$	3150	531	$1\frac{3}{8}$	1900	886
$\frac{5}{8}$	5400	309	$1\frac{1}{8}$	2800	594	$1\frac{5}{16}$	1720	968
$\frac{7}{8}$	4650	356	$1\frac{3}{8}$	2550	659	$1\frac{1}{2}$	1600	1056
$\frac{5}{16}$	4050	408	$1\frac{1}{4}$	2250	735	$1\frac{3}{16}$	1450	1143

Prices and weights are the same for all capacities and are given above. It requires 5 horsepower to drive this pump at the speed given.



No. 2 Geared Triplex Power Pump (2609)

9-16 BY 2 1-2 INCH CYLINDERS.

This pump is capable of pumping 141 cubic inches of water per minute against a pressure of 5000 pounds per square inch. It has three plungers, $\frac{9}{16}$ inch diameter, $2\frac{1}{2}$ inch stroke; ratio of gearing, 3 1-5 to 1; pulleys, 24 by $2\frac{3}{4}$ inches, tight and loose, 256 revolutions per minute; size of discharge pipe, $\frac{3}{8}$ inch extra heavy pipe; floor space, 32 by 26 inches; extreme height, 32 inches.

Weight with base plate only, 740 pounds.	Price, \$.....
Weight with tank and base, 1130 pounds.	Price, \$.....
Weight without tank and base, 600 pounds.	Price, \$.....
Westinghouse Type S motor, extra.	Price, \$.....
(When mounted on same base as pump).	
Westinghouse Type S motor, extra.	Price, \$.....
(Including self starter, etc., for accumulator service).	

This pump can be built with the different sizes of plungers listed below, the working pressure, capacity and pipe sizes varying, but all other data remaining the same. Diameters are in inches; pressures in pounds per square inch; capacities in cubic inches per minute.

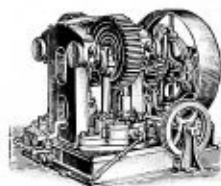
CAPACITIES OF NO. 2 PUMP.

Diam.	Press.	Cap.	Diam.	Press.	Cap.	Diam.	Press.	Cap.
$\frac{7}{16}$	8000	85	$\frac{3}{4}$	2700	251	$1\frac{1}{16}$	1350	506
$\frac{1}{2}$	6100	112	$\frac{5}{16}$	2300	295	$1\frac{1}{8}$	1200	565
$\frac{9}{16}$	4850	141	$\frac{3}{8}$	2000	342	$1\frac{3}{16}$	1080	630
$\frac{5}{8}$	3800	174	$\frac{9}{16}$	1740	394	$1\frac{1}{4}$	980	700
$\frac{11}{16}$	3200	212	1	1530	448	—	—	—

Prices and weights are the same for all capacities. It requires 2 horsepower to drive this pump at the speed given.

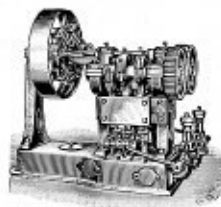
Geared Four Plunger Pump (1586)

This pump is designed for use with a hydraulic elevator and it is so constructed that it is started and stopped by the controlling rope from the elevator car. The pump runs only when the elevator is lifting. There are two shafts, each driving two plungers and driven by gearing from the main shaft, on which is a friction clutch pulley. If desired, the pump can be furnished without the elevator attachments. There is a bypass valve on the pump so arranged that it is opened to let the elevator descend, the speed depending on the amount the valve is opened.



Geared Six Plunger Pump (1713)

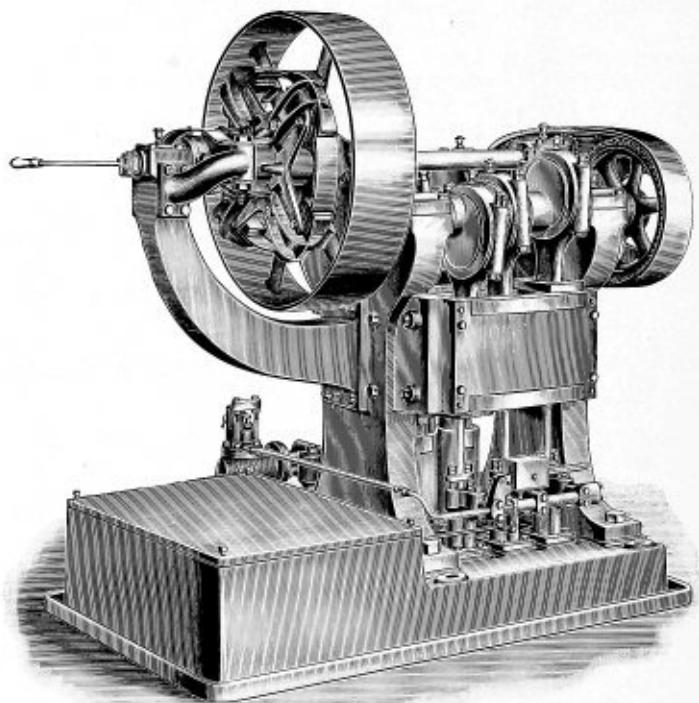
The cut shows two bypass valves for use when this pump drives two cabbaging machines (page 49 H). In general design the pump is similar to No. 1964 (page 127 H), both sides however delivering at the same pressure. The two sides of the pump have no connection on the water side, each delivery running through its bypass valve to its own press. If desired, the pump can be made without the bypass valves. Sizes, etc., are given in the table opposite.



Small Power Pumps.

We make a line of pumps similar to those described on pages 118 to 123 H which are not geared, the tight and loose pulleys being attached to the crank shaft. They are in the second part of the table opposite.

These pumps as well as the geared ones can be built to throw water at various pressures; the capacity increases as the pressure per square inch decreases.

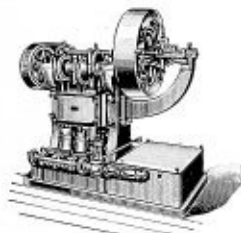


Geared Compound Power Pump (1964)

Capacity, 575 Cubic Inches per Minute Against 8000 Pounds per Square Inch Pressure, or 12600 Cubic Inches per Minute Against 300 Pounds per Square Inch Pressure.

No. 14 Geared Compound Power Pump (1964)

As a rule this pump is used with an embossing press as described on page 5 H and as illustrated on page 9 H. The automatic bypass valve mentioned in the description is used with the pump. There are two steel crank shafts geared three to one to the main shaft, cut gears well guarded being used. The base of the pump forms a tank, all parts of which are very accessible for cleaning. There are three low pressure plungers, 4 inches in diameter, and three high pressure plungers, $\frac{7}{8}$ inch diameter, all with 5 inches stroke. The low pressure side will deliver 12000 cubic inches per minute against 300 pounds per square inch pressure, the high pressure side 575 cubic inches against 8000 pounds.



The friction clutch pulley is 36 inches diameter, 9 inches face, and runs 200 revolutions a minute. Low pressure delivery, $1\frac{1}{4}$ C pipe; high pressure, $\frac{3}{8}$ xx pipe; floor space, 74 by 54 inches; extreme height, $75\frac{1}{8}$ inches. The pump is fitted with low pressure bypass valve and check valve.

Weight, 8700 pounds. Price, \$.....



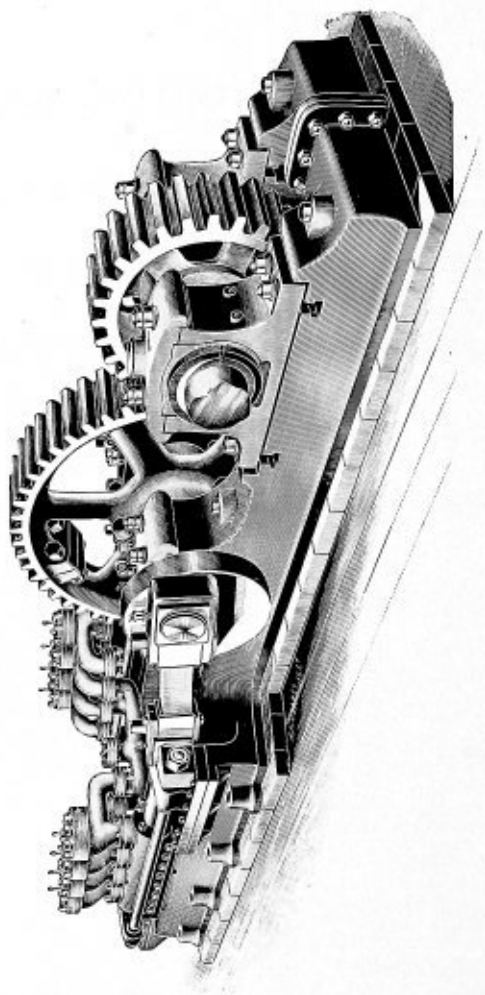
This same design of pump is shown motor driven on pages 10 and 12 H. It is shown again on page 16 H with all water passages made of bronze.



No. 5 Geared Compound Power Pump (3125)

This design is used where a smaller pump than No. 1964 (described above) will be satisfactory. It is of the same general design but has no tank; it is fitted with low pressure bypass valve and check valve; there are three low pressure plungers $2\frac{1}{2}$ inches in diameter and three high pressure plungers $1\frac{3}{8}$ inches in diameter, all with 3 inches stroke. The pump will deliver 3600 cubic inches of water per minute against 400 pounds per square inch pressure or 660 cubic inches per minute against 2500 pounds per square inch pressure; friction clutch driving pulley is 24 by $4\frac{1}{4}$ inches, 265 revolutions per minute; floor space, 53 by 48 inches. For capacities of high pressure side at other pressures than that given above, see table on page 122 H.

Weight, 3065 pounds. Price, \$.....



6 by 20 Inch Duplex Power Pump (2225)

CAPACITY, 280 GALLONS PER MINUTE. WORKING PRESSURE, 2000 POUNDS PER SQUARE INCH.

6 by 20 Inch Duplex Power Pump (2225)

This pump has four plungers, 6 inches diameter, 20 inches stroke which each make 30 strokes per minute against 2000 pounds per square inch pressure, throwing in all 280 gallons per minute. It is designed so that it will discharge water directly to a bench or into an accumulator system and suitable valves for doing this (see the next page) are furnished with it. The bed is cast iron, suitably proportioned to withstand the strains coming upon it, and adapted for mounting on a foundation. The main bearing frame is cast solid with the bed and holds the boxes, which are phosphor bronze at the wearing surfaces, elsewhere cast iron babbitted. They have all necessary provision for taking up wear as well as suitable lubricating devices. The line shaft bearings are of our standard pattern, water cooled and babbitted. The crank shaft is forged steel, with enlarged ends which hold the crucible steel crank pins. Connecting rods are forged steel, with phosphor bronze boxes held in place by a strap and tapered keys. The plungers are cast iron, bolted to the crossheads, and outside packed with square flax packing held in place by a bronze gland. Above the cylinders, which are made of the best charcoal iron, are the valves, one suction and one delivery valve for each plunger. The valves are spherical, of phosphor bronze, with steel seats. Both valve and seat are arranged so that renewal or regrinding is easy. The valve pots are charcoal iron. The water comes to the pump through one 5 inch common pipe and is distributed to the suction valves by a four branch elbow. Unless otherwise specified this elbow will receive the water from overhead. The delivery is such that each side has a separate pipe joining it with one side of the nest of valves shown on page 130 H.

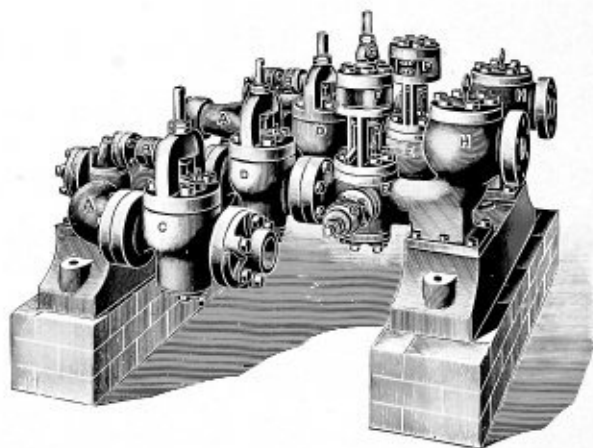
Some dimensions of the pump are here given; ratio of gearing, 2 to 1; line shaft, 60 revolutions per minute; center of line shaft, 32 inches above floor; delivery pipes, two 4 xx; foundation for pump and valves combined, about 34½ feet long, 10½ feet wide, the line shaft being 45 inches from one end; average piston speed, 100 feet per minute; floor space of pump alone, 25 feet 5 inches by 9 feet 10 inches; extreme height, 89¼ inches; height above floor, 71½ inches.

It requires 350 horse power to run this pump at the given speed against 2000 pounds per square inch pressure and 175 horse power against 1000 pounds per square inch pressure.

Weight, including shafting and nest of valves, 99200 pounds.

Price including shafting and nest of valves, \$.....

See also the bottom of page 131 H.



6 by 20 Inch Duplex Power Pump (2225)

The cut above represents the valves furnished with the pump just described. As shown, the whole delivery of one pump can be sent into an accumulator system (1000 pounds per square inch pressure) or directly to a push bench (2000 pounds per square inch pressure). These valves are located below the pump room floor and in the rear of the pump. The pipes from the pump delivery valves go down into a recess in the foundation and turn away from the gearing so as to run directly out into the basement. At any convenient point, but preferably close to the pump, a foundation is erected and the nest of valves set on it.

The water enters at A. B is a 2000 pound safety valve, G a 1000 pound safety valve. C and D are balanced stop valves (No. 2225 A, page 148 H) designed to open and close easily under full pressure. H is a check valve which closes and prevents any escape of water from the accumulator when bypass valve E is open. F is the operating cylinder for E. The piston in F and the valve in E are on the same rod and are moved by water under accumulator pressure. Whether E is open or closed depends on the posi-

tion of the accumulator ram. An arm on the ram (see page 94 H) is connected by a chain, sprockets, and gearing to the valve controlling table so that when the accumulator goes down, the various controlling valves act successively, closing one by one the bypass valves E. If the accumulator is near the bottom of its stroke, all the pumps send water into it in the endeavor to fill it. When the consumption of water by the benches falls off, the accumulator rises again and opens one by one the valves E, the pump delivery being returned to the tank through the bypass main. When bypassing, the power consumed by the pumps is small. Provision is made for closing the bypass valves by hand when there is no pressure in the accumulator system. At the controlling table, there is an arrangement for changing the order in which the pumps are cut out. Since the pump which is cut out first when the accumulator rises has the least to do and consequently the least wear, it is thought best to give each pump in turn this easier duty. The cylinder and piston F are bronze, the valve in E steel, faced with bronze and seating on a steel ring. The valve in H is like those in the pump delivery valves. The controlling table is included with the pump.

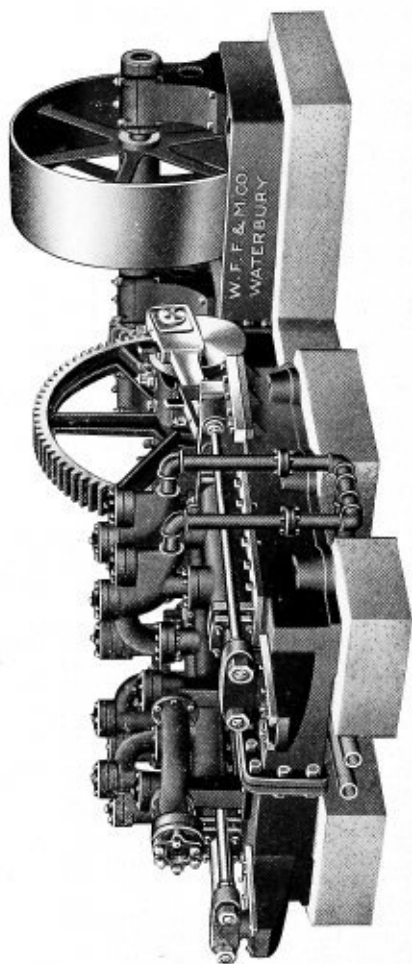
When the pump is to be used with an accumulator system only, valves C and the fittings at A are left out of the nest of valves. This omission takes out 3000 pounds from the weight and reduces the price of one pump \$....



Shafting and Gearing for Pump (2225)

The line shaft, which is forged steel, 12 inches in diameter, is coupled directly to the engine crank shaft by a plate coupling, which we furnish. The gears are cut, and within certain limits the gearing ratio can be changed without additional cost so as to permit a different engine speed. Correspondence on this subject is solicited. It is generally the case that more than one of these pumps are furnished. They are spaced 12 feet apart. The weights and prices given below include shafting and nests of valves for each pump.

Weight of one pump, 99200 pounds.	Price, \$.....
Weight of two pumps, 194000 pounds.	Price, \$.....
Weight of three pumps, 293200 pounds.	Price, \$.....



5 1/4 Inch by 15 Inch by 1500 Pound Duplex Pump (3201)
CAPACITY, 223 GALLONS PER MINUTE. WORKING PRESSURE, 1500 POUNDS PER SQUARE INCH.

5¼ by 15 Inch by 1500 Pound Duplex Pump (3201)

This pump is designed for feeding an accumulator system, and is belt driven.

There are two single acting, outside connected, outside packed, double plunger pumps, joined at suction and discharge and driven from the same crank shaft with cranks quartering. Each of these independent pumps has its own valves, so actuated by the accumulator that when the latter is full the pump is automatically bypassed, starting to deliver again when the accumulator falls.

The pulley shaft is of hammered steel, turning in babbitted ring oiling bearings, and it drives the crank shaft through cut spur gearing. The crank shaft itself is forged steel, its enlarged ends holding the crank pins.

The main bearings are cast solid in the bed, and hold the main boxes, which are of phosphor bronze at the wearing surfaces and babbitted cast iron elsewhere. These running parts are provided with complete means for taking up wear and for lubricating. The connecting rods are forged with strapped ends holding phosphor bronze boxes.

All water passages are large, with easy turns, and the valves are easily accessible for inspection and regrinding the seats.

SPECIFICATIONS.

Four plungers 5¼ in. diameter, 15 in. stroke, 42 strokes per minute,
1500 pounds per square inch pressure.

Theoretical capacity, 223 gallons per minute; horse power, 206.

Pulley, 72 in. diameter, 25 in. face.

Suction pipe, 5 in. common.

Delivery pipe, 5 in. xx.

Bypass pipe, 5 in. common.

Ratio of gearing, 6 2-7 to 1.

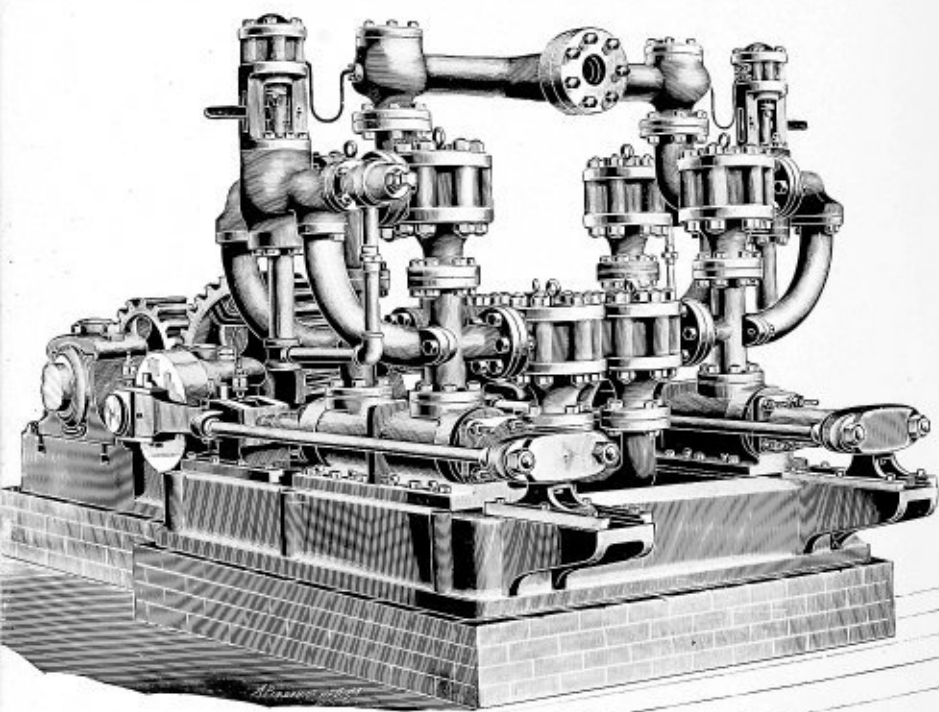
Line shaft, 264 revolutions per minute, 3 feet and 9 inches above floor.

Foundations, 17 ft. 11⅝ inches by 11 ft. 2⅞ in., at the floor level

Floor space, 19 ft. 4⅝ in. by 11 ft. 9 in.

Weight, 49105 pounds.

Price, \$.....



4¾ by 12 Inch Duplex Power Pump (2252)

CAPACITY, 140 GALLONS PER MINUTE.

WORKING PRESSURE, 1000 POUNDS PER SQUARE INCH.

4½ by 12 Inch Duplex Power Pump (2252)

This pump consists of two independent, outside connected, outside packed, double plunger pumps, joined at suction and discharge and driven from the same crank shaft with the cranks quartering. One side only may be run by disconnecting the opposite connecting rod. Like the larger pump shown on page 128 H, each side has its own bypass, safety and check valves, in this case all mounted on the pump. The bypass valves are controlled by the accumulator, as described on page 130 H. All valve seats are tool steel, hardened, forced in place and ground. They are readily examined by removing the valve caps. The valves are of bronze, easily removable for regrinding. The water passages are made large with all turns easy, so as to reduce to a minimum friction losses. The running parts are provided with complete arrangements for lubrication and for taking up wear. The gears connect the crank and line shafts. All parts subjected to water pressure are of the best charcoal iron, amply proportioned. The crank shaft, connecting rods and side rods are forged steel.

The pump has four plungers, 4¾ inches diameter, 12 inches stroke, and will pump 140 gallons of water per minute against a pressure of 1000 pounds per square inch, each plunger making 40 strokes. Ratio of gearing, 17 to 10; line shaft, 8¼ inches diameter, about 70 revolutions per minute; center of line shaft, 33¾ inches above the floor; delivery pipe, one 4 xx; suction one 4 inch common pipe; foundation, 17 feet long, 7 feet 4 inches wide, the line shaft being 41 inches from one end; average piston speed, 80 feet per minute; floor space, 17 feet 1 inch by 8 feet 11 inches; extreme height, above floor, 7 feet 7 inches; total height of pump, 7 feet 4½ inches. It requires 90 horse power to run this pump at the given speed.

Weight of one pump, without shafting and gearing, 24800 pounds.

Price of same, including valves, \$.....

For prices, weights and description of shafting see the next page.

Shafting and Gearing for Pump (2252)

SEE THE PRECEDING PAGE.

It is possible to build this pump so that it can be driven from a line shaft running at a different speed or of a different diameter from the figures given on the last page. If more than three or four pumps are to be driven from the same engine, a larger line shaft is preferable. Changes in speed, within certain limits, can be provided for by changing the gearing ratio. The pumps should be spaced 10 feet apart center to center. The table below gives weights and prices for shafting for these pumps. The price includes the pump gear, line shaft pillow block, a pinion with a jaw clutch for connecting the pump to the line shaft and the line shaft itself. The clutch can be thrown out at any time when the pump is not loaded and the pump stopped.

SPECIFICATIONS.

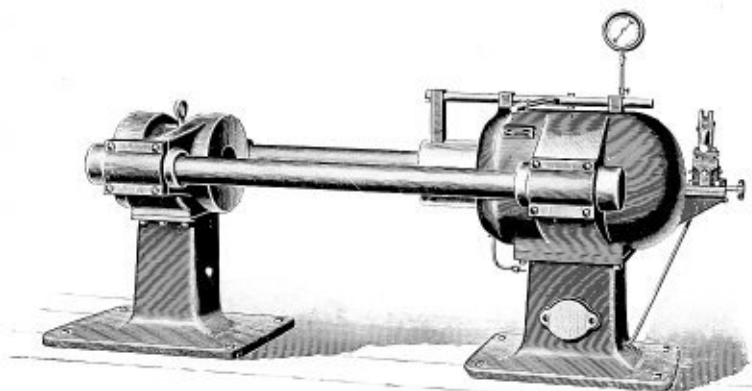
	Pounds.	\$
8¼ inch shafting for one pump.....	8465	.....
10 inch shafting for one pump.....	9825	.....
8¼ inch plate couplings.....each	1800	.....
10 inch plate couplings....."	2100	.....



Portable Forcing Machine (1812)

For forcing gears, flywheels, pulleys and couplings on to and off from shafts. It has two bars connecting the heads, one of which contains an 8 inch cylinder with 12 inch stroke. These heads are adjustable on the rods at 2 foot intervals, the extreme distance between the heads being 25 feet 10 inches. There is a hand pump with 5/8 inch plungers bolted to the bed. Capacity, 125 tons; working pressure, 5000 pounds per square inch; distance between bars, 45 inches; length over all, 30 1/2 feet; extreme width, 58 inches; weight of largest part, about 2900 pounds.

Weight, 4880 pounds. Price, \$.....



200 Ton Forcing Machine (2721)

Designed for forcing collar rolls on to or off from their arbors. With a longer distance between heads this press could be used for forcing gears, pulleys or couplings. A 125 ton machine for similar uses is described on the page opposite. The cylinder of the press shown above is 11 inches diameter, 12 inches stroke; distance between stationary head and ram when back, 42 inches; clear distance between tie rods, 23 inches; capacity, 200 tons; working pressure, 4200 pounds per square inch; floor space, 112 by 36 inches; floor to center of ram, 30 inches. The pump shown is No. 1812 A with $\frac{5}{8}$ inch plungers and $1\frac{1}{2}$ inches stroke.

Weight, with pump, 6640 pounds. Price, \$.....

Annealing Tube Loader (2067)

For forcing coiled strips of steel into an annealing tube. The machine consists of a bed plate carrying a horizontal cylinder 11 inches diameter, 25½ inches stroke. The piston rod has on its outer end a disc 14 inches diameter which travels through an open trough into which the coils are placed. The stroke of the ram forces them forward into the annealing tube. The ram is returned by weights. No valves are furnished with the machine. Exclusive of the annealing tube (15 inches inside diameter, 21 feet 8 inches long), which we do not furnish, the machine is 25 inches high and occupies a floor space of 98 by 30 inches. Working pressure, 100 pounds per square inch; piping, 1½ inch common pipe.

Weight, 2070 pounds. Price, \$.....



Hydraulic Bridle (2129)

For rolling mills. The metal sheets to be rolled are passed between two wooden strips and then through the rolls. A hydraulic cylinder presses the wooden strips together and so regulates the tension on the metal as it goes through the rolls. The device is bolted to the roll housings.

Weight, 400 pounds. Price, \$.....



Arbor Support (64)

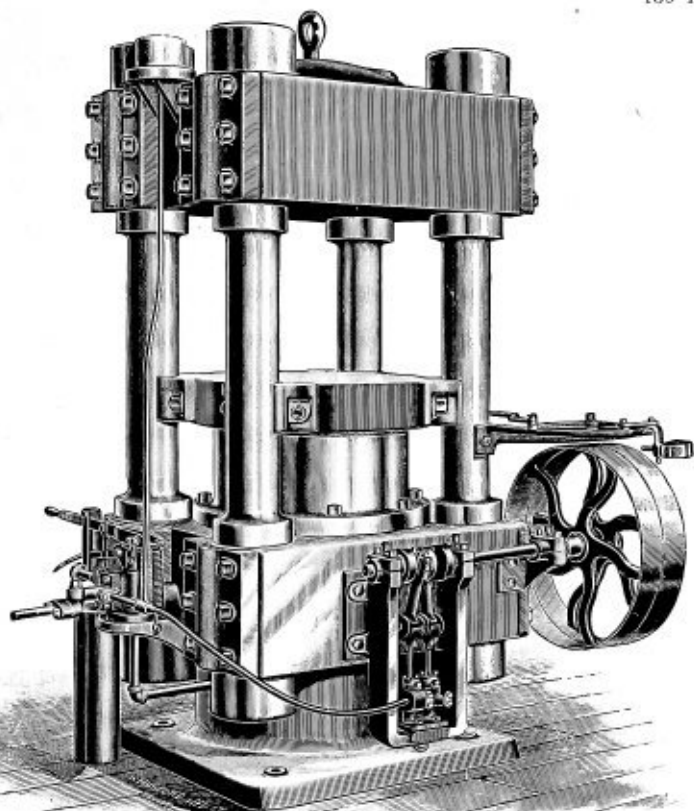
This is used on pull benches 43 and 52, page 87 H. It consists of four jaws operated like those of a geared chuck which come together on the arbor and keep it in line during the drawing. It slides along the guides. The support will take in arbors from 5 inches to 1 inch in diameter.



Testing Machine (2885)

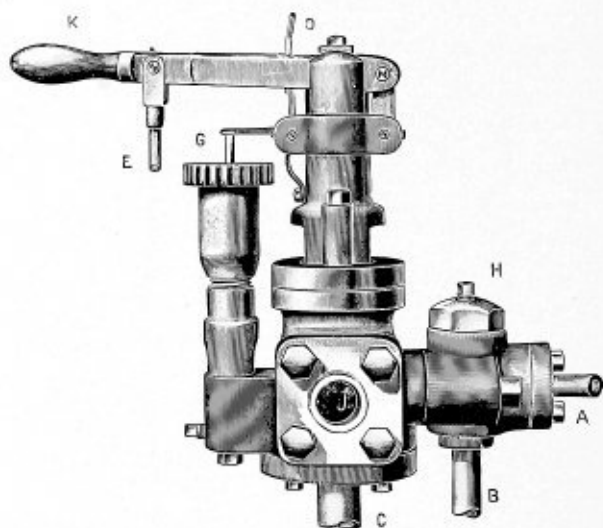
It is used for testing small objects such as horse nails, wire, etc., and is equipped with a hand pump (No. 1458, page 125 H), two pressure gauges, relief valve, tank and strainer. It is shown in photo 989. Maximum pull, 25000 pounds; floor space, 58 by 30 inches.

Weight, 860 pounds. Price, \$.....



The press shown above is similar to No. 2116 and has a small two plunger power pump bolted directly to the lower platen, the base forming the water tank. This arrangement can be used with the automatic bypass valve, shown on page 140 H. We present below a few figures relating to pumps mounted in this way, and we are ready to quote prices on them mounted on any press desired. As a rule we then make the press base so that it can be used as a tank. These pumps all have tight and loose pulleys which should run 135 revolutions per minute.

	Number of Pump	895 A	952	1065	1239
Number of plungers.....		3	2	3	2
Diameter of plungers..... inches		$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{5}{8}$
Stroke of plungers..... "		$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	3
Diameter of pulleys..... "		24	24	30	28
Face of pulleys..... "		3	3	$3\frac{3}{4}$	$3\frac{1}{4}$
Size of discharge pipe.....		$\frac{3}{8}$ x	$\frac{3}{8}$ x	$\frac{1}{2}$ xx	$\frac{3}{8}$ x
Working pressure..... lbs. per sq. in.		5000	6000	8000	5000
Capacity..... cu. ins. per min.		240	117	172	236
Weight..... pounds		650	515	750	550
The pump alone will cost..... \$					



Automatic Bypass Valve (1371)

PATENTED JULY 30, 1895.

This valve is used with embossing presses as explained on page 5 H. It regulates the maximum pressure exerted on the dies. As illustrated, it is combined with a check valve H, so as to permit the use of a compound pump with the press. The high pressure pipe, $\frac{3}{8}$ xx, enters at A, the low pressure, $\frac{3}{4}$ C, at B, while C is the exhaust pipe, $1\frac{1}{4}$ inch common pipe. The pressure at which the valve trips is regulated by turning the knurled nut at G. To start the press, it is necessary to force K down, which can be done by hand or by stepping on a treadle to which the rod E is attached. To stop the press before the maximum pressure is reached, throw D to the right by hand. The valve is 16 inches high, and occupies a space of 18 by 12 inches.

Weight, including check valve, 75 pounds. Price, \$.....

Price, without check, \$.....

Automatic Bypass Valves.

PATENTED JULY 30, 1896.

Other forms of the valve shown on the opposite page are described below and data concerning them is in the table at the bottom of this page. Where the automatic bypass valve is used with a compound pump two accessories must be provided, a check valve on the pipe from the pump and the treadle rig. The check valve need not be attached to the bypass valve and it is usually furnished as a part of the compound pump; the treadle rig is furnished also as a part of the pump except when the pump and press are not near each other, in which case an extra charge is made for it.

No. 3399 is adapted for mounting on a bracket in the way shown on page 38 H; has a check valve; the pipe to the press does not lead from it.

No. 3484 A will mount on a bracket as shown on page 38 H; it has no check valve; the pipe for the press does not lead from it.

No. 3428 A mounts on a rod as illustrated on page 10 H; it has no check valve and the pipe to the press leads out of it. No. 2568 A is the same design.

No. 2666 A and No. 2668 A are both fitted with a special check valve on the pipe to the press but have no check valve on the pipe from the pump; they mount on a pedestal as shown on pages 12 and 46 H; see also photo 820.

No. 2698 A mounts on a pedestal as shown on page 16 H; it has no check valve and the pipe to the press does not lead out of it.

No. 3456 A bolts directly to the side of a press cylinder and has a $\frac{3}{8}$ inch round hole leading directly into the cylinder; there is no check valve. No. 895 A is the same type of valve but has a $\frac{1}{2}$ inch hole into the cylinder; see cut on page 42 H.

No. 3022 A bolts to a bracket (page 38 H) and has no check valve; the pipe to the press cylinder comes out of the valve.

No. 3332 bolts to the side of press 520, page 28 H; has no check valve; the opening into the press is $\frac{3}{8}$ inch diameter.

✦

SPECIFICATIONS.

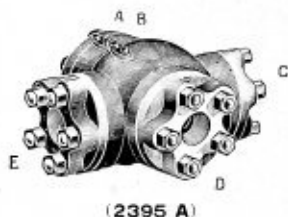
Number of Valve	Inlet Pipes		Pipe to Press	Pipe to Tank	Height, Inches	Fl'rSpace, Inches	Price, *\$
	HighP.—L'wP.						
3399	1xx—1½ C	—	—	2 C	16	13 by 15	.....
3484 A	2 xx	—	—	2 C	16	8 by 15	.....
3428 A	1¼xx	2 xx	1¼ C	1¼ C	16	16 by 16	.....
2568 A	1¼xx	1½xx	1¼ C	1¼ C	16	16 by 15	.....
2666 A	1¼xx	1½xx	1¼ C	1¼ C	16	17 by 11	.....
2698 A	1¼xx	—	1¼ C	1¼ C	15	16 by 6	.....
3456 A	1¼xx	—	1¼ C	1¼ C	15	15 by 7	.....
3332	¾x	—	—	1 C	15	14 by 6	.....
2668 A	1 xx	1 xx	1 xx	1 C	12	15 by 10	.....
3022 A	¾xx	¾xx	¾ C	¾ C	13	14 by 8	.....
895 A	½xx	—	—	¾ C	13	13 by 6	.....

*Without pedestal or bracket.

Hydraulic Bypass Valves.

FOR DIRECT DRIVEN BENCHES.

For use with a bench which is piped directly to a power pump. When the valve is opened it relieves the pressure on the bench by allowing the full discharge of the pump to return to the tank. To start the bench, close the bypass valve. The valve is operated by water pressure and controlled by a pilot valve. The valve and stand on page 150 H or the pilot valve on page 151 H may be used for this purpose. The body is of charcoal iron with bronze valve and piston. The moving parts are leather packed. All parts are of suitable strength, with ample water passages. Nos. 2194 A and 2395 A are arranged to set in the pipe, the return to the tank coming out at D. Pipe flanges are furnished with the valves. No. 822 B is an elbow valve and is shown in the cut on page 80 H.



SPECIFICATIONS.

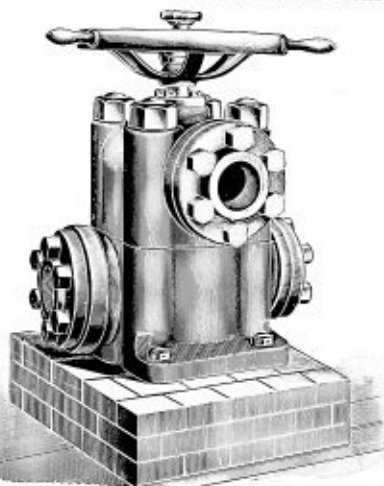
Number of Valve	2194 A	2395 A	822 B
Size of pipe.....	4xx	3xx	3x
Working pressure.....lbs. per sq. in.	2000	3000	1000
Flange to flange..... inches	15	15	—
Size of valve..... "	24 by 12	24 by 12	12 by 9
Height of valve..... "	19	19	17
Size of exhaust pipe.....	4 C	3 C	3 C
Weight..... pounds	530	560	185
Price of valve..... \$	.....	.....	.....

Bypass and safety valves Nos. 1563 and 2569 are used with the low pressure side of compound pump No. 1964. They each have a high pressure weighing plunger.

Hydraulic Reversing Valves.

FOR DIRECT DRIVEN BENCHES.

These are rotary slide valves with one port under the valve for each end of the bench and for the exhaust. The supply pressure is above the valve. The bodies are cast iron, the valves bronze, and the tie bolts steel. The



(2086 A)

spindle is outside packed with square flax and the valve has suitable holes for bolting it to a foundation. Valves 2086 A, 2746 A and 1344 B have relief valves so that if the work sticks in the dies the valve can be reversed after letting the pressure off. No. 1344 B is shown on page 68 H. No. 2086 A is partially balanced so that it can be turned under a moderate water pressure without using the relief valve and it has an oil pump for oiling the sliding surface of the valve; No. 3124 A is also partially balanced. Valves 2746 A, 3124 A, 1691 A, 1344 B, and 2086 A have handwheels to turn the valve. Nos. 830 A

and 822 A can be operated as shown on page 80 H, or by a pedestal as shown on page 145 H. We do not furnish the operating rig with these two valves. No. 822 A has the exhaust pipe on the bottom and one bench pipe on top, the pipes for the other end of the bench and the pump coming in at the sides at an angle of 45 degrees with the floor. No. 1263 A is a special two way reversing valve for use with a hydraulic elevator. No. 2090 B is shown in photo 819, two valves being mounted on the same pedestal for use with knockout device 2090 A, page 15 H.

The specifications relating to these valves will be found on page 145 H.

Bypass and Reversing Valves.

FOR DIRECT DRIVEN BENCHES.

The table below combines different valves and attachments into complete sets of valves for hydraulic benches direct connected to a power pump. The pedestal and handwheel No. 2395 C, shown in the cut opposite, are included as well as the small pilot valve shown on the projecting arm. This valve is used to control the bypass valve, which is set in the supply pipe to the reversing valve.

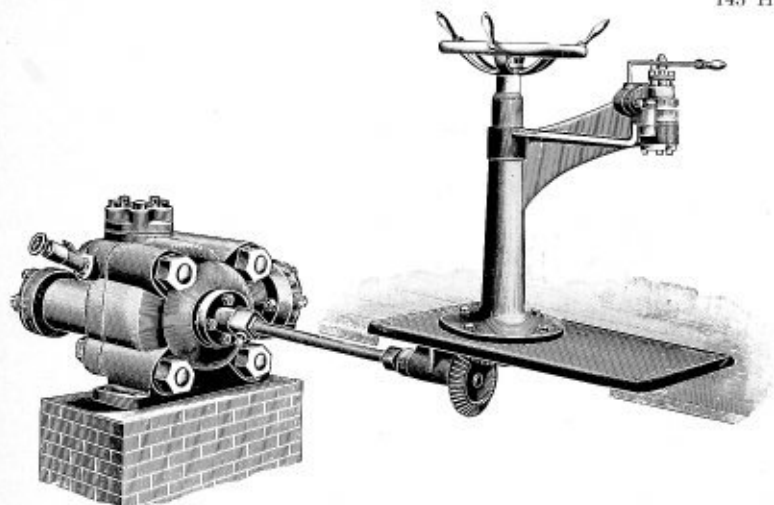
SPECIFICATIONS.

Number of Machine	2194 D	2395 D
Size of pipe.....	4xx	3xx
Maximum working pressure.....lbs. per sq. in.	2000	3000
Bypass valve used..... No.	2194 A	2395 A
Reversing valve used..... "	2194 B	2395 B
Pilot valve and reversing wheel..... "	2395 C	2395 C
Total weight..... pounds	3330	3420
Price..... \$	.....	.....



Valve No. 2232 has the bypass, reversing and pilot valves combined in one. It is used with a direct acting pump and has a handwheel and stand similar to that shown opposite. It has a rotary slide valve, which can be lubricated, the spindle of which is vertical. The valve goes below the floor. It is for 3x pipe and 1000 pounds per square inch pressure. Height of valve, 27 inches; floor space occupied, 32 by 22 inches; handwheel, 18 inches diameter, 30 inches above the floor. Weight, 1630 pounds. Price, with pedestal, \$.....

Bypass and reversing valve No. 549 is for use with a power pump and double end push bench No. 548. Weight, 230 pounds. Price, \$.....



Reversing Valve (2395 B) and Controlling Stand (2395 C)
Described on the page opposite.

Hydraulic Reversing Valves.

FOR DIRECT DRIVEN BENCHES.

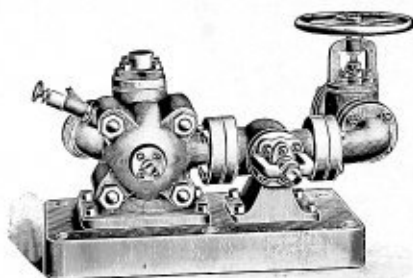
Described on page 143 H.

SPECIFICATIONS.

Number of Valve.	Size of Pipe, Inches.	Working Pressure, lbs. per sq. inch.	Horizontal or Vertical Spindle.	Size of Valve, Inches.	Height of Valve, Inches.	Weight, Pounds.	Price, \$
1691 A	4x	1500	V	28 by 18	39	1700	.....
830 A	4x	1200	H	28 by 37	16	1700	.....
822 A	4x	750	H	34 by 32	20	1900	.....
2086 A	3x	1000	V	18 by 12	32	915	.....
3124 A	2xx	2500	V	24 by 24	32	1000	.....
1263 A	2 G	90	H	21 by 9	14	120	.....
2746 A	1 1/4 xx	1500	H	20 by 16	14	180	.....
2090 B	1 1/4 C	125	V	12 by 12	18	60	.....
1344 B	1x	2000	H	19 by 17	17	160	.....

Hydraulic Throttle Valves.

FOR ACCUMULATOR DRIVEN BENCHES.



VALVES 2195 B, 2195 C, 2195 A.

For regulating the speed and for use in starting and stopping large hydraulic benches. The valve is placed between the reversing valve and the accumulator main, a stop valve as a rule being placed beyond it. These throttle valves are the stop valves described on the top of page 148 H with the addition of a foot and a relief valve which releases the pressure on the reversing valve when the throttle is shut and thus enables the operator to reverse the bench easily. The valve and its seat are readily removed for renewal or repairs.

SPECIFICATIONS.

	Number of Valve	2194 C	2195 C
Size of pipe.....		4xx	3xx
Working pressure..... lbs. per sq. in.		1000	1000
Weight..... pounds		650	550
Price of valve alone..... \$			

When a throttle and a reversing valve are used with the same bench, it is best to have them bolted together as shown in the cut above. Then the two valve spindles can be coupled directly to two shafts running along under the floor to a floor plate carrying two pedestals and handwheels similar to the one shown on page 145 H. Weight of controlling stand for reversing and throttle valves, 1460 pounds. Price, \$.....

No. 2765 is throttle valve 2195 C mounted in a pipe line running directly under the floor and combined with a pedestal and handwheel attached to a vertical shaft.

Weight, 720 pounds. Price, \$.....

Throttle and Reversing Valves.

FOR ACCUMULATOR DRIVEN BENCHES.

The table below gives the combined weights and prices of complete sets of valves for hydraulic benches driven from an accumulator system. Included in each set are one reversing valve, one throttle valve, one elbow, one stop valve and a base plate.

SPECIFICATIONS.

	Number of Machine	2194 E	2195 E
Size of pipe.....		4xx	3xx
Maximum working pressure..... lbs. per sq. in.		1000	1000
Reversing valve used.....		2194 B	2195 B
Throttle valve used.....		2194 C	2195 C
Stop valve used.....		2225 A	2195 A
Weight..... pounds		5650	2475
Price..... \$			



Hydraulic Reversing Valves.

FOR ACCUMULATOR DRIVEN BENCHES.

These valves can be used on benches driven either directly from a power pump or from an accumulator, while those listed on page 145 H cannot be used with an accumulator without a serious loss of water under pressure. The valves described below are of the same design as No. 2395 B (shown on page 145 H), are partly balanced and have oiling pumps. The controlling stand shown is not included with the valve. No. 2195 B is illustrated on page 146 H.

SPECIFICATIONS.

	Number of Valve	2194 B	2395 B	2195 B
Size of pipe.....		4xx	3xx	3xx
Working pressure..... lbs. per sq. in.		2000	3000	1000
Floor space..... inches		36 by 32	36 by 32	29 by 25
Height..... "		26	26	22
Weight, with flanges..... pounds		2340	2400	770
Price..... \$				

Weight of controlling stand for reversing valve alone, 420 pounds. Price, \$.....

Hydraulic Stop Valves.

BALANCED.**FOR PIPE LINE USE.**

We have designed the valves listed below to meet the heavy requirements exacted of hydraulic valves in high pressure service. These valves have cast iron bodies; all moving parts are of bronze with the wearing parts easily removable; the water passages are smooth with easy turns; all are plug valves balanced so that they will open or shut under pressure. No. 2225 A is shown at C on page 130 H and No. 2195 A at the right in the cut on page 146 H.

SPECIFICATIONS.

Number of Valve	2225 A	2260 A	2195 A	2260 B
Size of pipes.....	4xx	4xx	3xx	3xx
Working pressure.... lbs. per sq. in.	2000	1000	1000	1000
Straightaway or elbow.....	S	E	S	E
Weight with flanges..... pounds	570	530	450	440
Price..... \$				

Hydraulic Stop Valves.

UNBALANCED.**USED WITH PRESSES.**

These valves have been designed for use with slow speed hydraulic presses and have four stems combined in one casting in such a way that the press can be started, stopped or reversed at will, when accumulator driven. No. 2957 B is shown in the cut on page 70 H and is for one inch xx pipe; price, \$..... No. 3025 A is shown in the cut on page 72 H and is for 3/4 inch xx pipe; price, \$.....

Hydraulic Stop Valves.

BALANCED.**USED WITH PRESSES.**

The type of these valves is different from either type listed above; they are balanced lever plug valves mounted in pairs on a bracket in such a way that one lever will open one end of a press cylinder either to the pressure or to the exhaust. There is also a position when both valves are closed. No. 2766 A is for 3 inch extra heavy pipe, 500 pounds per square inch pressure; No. 2766 B is for 1 1/2 inch extra heavy pipe, 500 pounds per square inch pressure. The former is 37 inches high over the lever and occupies a space of 21 by 16 inches; the latter is 37 by 16 by 12 inches.

No. 2766 A, Weight, 200 pounds. Price, \$.....

No. 2766 B, Weight, 100 pounds. Price, \$.....

Plug Valve 1172 A is a 1 1/2 inch xx pipe stop valve for 3000 pounds per square inch pressure; it is a straightaway valve, not balanced; size, 11 by 6 inches, 14 inches high.

Weight, 75 pounds. Price, \$.....

Draw Bench Operating Valves.

FOR ACCUMULATOR DRIVEN BENCHES.

These valves are combined throttle and reversing valves for pull benches only and are designed to be fastened to the cylinder of the bench as shown on page 89 H. The reversing valve is a plain slide valve, not balanced. When the throttle valve is closed, a relief valve is opened allowing the operator to move the reversing valve. The speed of the bench is determined by the amount the throttle valve is opened. The ports are such that the grip is returned to the die head by the water displaced by the piston rod. This improvement results in a great saving of power. There are four pipes leading to these valves. The supply comes in from one side, the exhaust leaves at the other, while the pipes for the front and back cylinder ports run along underneath the cylinders. The throttle valve is operated by a rotating shaft, the reversing valve by a reciprocating rod. Valve No. 2268 is for the operating side of a drawbench using 1½x pipe.

SPECIFICATIONS.

Number of Valve	2201A	2390A	1717A	2415A	2223A
Size of pipe.....	4xx	3xx	2½x	2x	1½x
Working pressure... lbs. per sq. in.	1500	1500	1000	1000	1000
Length..... inches	36	30	30	27	19½
Width..... "	40	34	29	27	21
Height..... "	19½	18	15½	13	10½
Weight of valves alone.... pounds	1550	1050	690	440	275
Price..... \$	.....	.....	.....	.....	.....

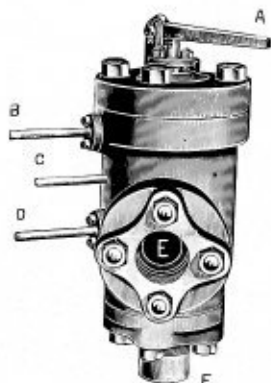
◆

Special draw bench valves 2939 A (3 inch xx pipe) and 2940 A (4 inch xx pipe) are described on page 78 H.

◆

Alleviator No. 2260 C is for use on the end of a 7 inch extra heavy pipe line. It is for 1000 pounds per square inch pressure, is 16 inches in diameter and 40½ inches long. There is an outside packed bronze ram, working in an iron body whose outer end bears on a heavy coiled steel spring. When water hammers occur in the pipe line, the spring yields and prevents injury to the machinery.

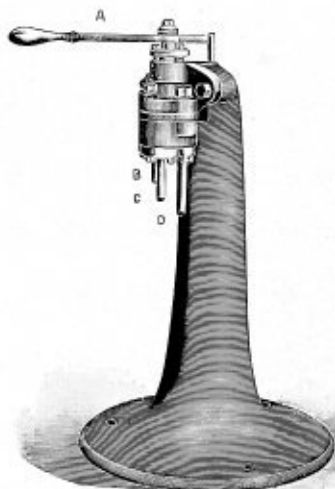
Weight, 275 pounds. Price, \$.....



Pressure Stop Valve (2406 A)

This valve is used to stop the flow of water in 3 inch xx pipe, used as part of an accumulator system. It is operated by the pressure of the water and is controlled by the valve and stand shown below. A is used to close the valve when the water pressure is off. The water enters at E and leaves at F. Working pressure, 1500 pounds per square inch; extreme height, 23½ inches; greatest diameter, 10¾ inches; body, charcoal iron; valve, bronze; small pipes, ¾x.

Weight, 380 pounds. Price,
\$.....

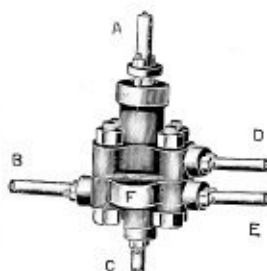


Controlling Stand (2406 B)

Designed to control stop valves such as the one shown above, by-pass valves as on page 142 H, etc. Size of pipe, ¾x; handle to floor 32 inches; base, 20 inches diameter; valve and body, of the best phosphor bronze. The valve is a small rotary slide valve with a small angle of motion and will work under any pressure up to 2000 pounds per square inch.

Weight, 170 pounds.
Price, \$.....

Pilot Valve (2293)



This valve, for $3\frac{3}{8}$ inch pipe, is designed to control pressure stop valves, automatic reversing valves, bypass valves, etc. The stem A can be fitted to receive a handle, handwheel, gear or sprocket wheel for moving the valve. The valve is of bronze, $11\frac{1}{2}$ inches high, and occupies a space of $8\frac{1}{2}$ by 7 inches. It will work up to 1000 pounds per square inch pressure. The motion of A is 32 degrees. The valve can be attached to any convenient object by posts bolted to the lugs F (one on each side)

Weight as shown, 31 pounds.

Price, \$.....



Pressure Stop Valve (1154)

For 4 inch extra heavy pipe. It is similar to No. 2406 A (see opposite page) in design, but is operated by an independent cylinder connected to the city water service, 90 pounds pressure, 1 inch common pipe. Working pressure, 1000 pounds per square inch; height, 40 inches; space occupied, 22 by $14\frac{1}{4}$ inches. There is a controlling valve located on the valve itself.

Weight, 560 pounds. Price, \$.....



Pressure Stop Valve (1276 B)

For 2 inch extra heavy pipe. It is operated by an auxiliary cylinder using the high pressure water. Valve stand No. 2406 B may be used with this valve. Working pressure, 800 pounds per square inch; height, $24\frac{1}{4}$ inches; space occupied, $11\frac{1}{2}$ by 7 inches.

Weight, 130 pounds. Price, \$.....

Miscellaneous Hydraulic Machinery.

Accumulator bypass and check valve No. 1825 is for use with an accumulator and power pump. It is attached to the former and is operated by a chain from the ram. When the accumulator is way up the water from the pump is bypassed and the check valve closes to prevent the escape of any high pressure water. It is for $3\frac{1}{4}$ x x pipe, 3000 pounds per square inch pressure, is 7 inches high, 11 by 9 inches in plan and weighs 16 pounds. Price, \$.....



Accumulator bypass and check valve No. 617 is designed to be bolted to an extra inlet to an accumulator and piped so that the whole delivery of a power pump enters the system through the valve. By the aid of auxiliary valves and weights, the pump delivery is bypassed when the accumulator is at the top of its stroke. It is for 3x pipe, 750 pounds per square inch pressure. Weight, 940 pounds. Price, \$.....



Check valve No. 1276 A is designed for 1000 pounds pressure and can be inserted in a 2x pipe. It is $11\frac{1}{2}$ inches long, $10\frac{1}{4}$ inches high, 7 inches wide, weighs 65 pounds and is priced at \$.....



No. 1107 shows a method of attaching valves and pipes to a press, compounding the delivery from two pumps.



Valves 1276 are attached to a vertical drawing press similar to No. 1897, page 66 H, for use with two water systems, an 800 pound high pressure and a 150 pound low pressure, in such manner that the high pressure water is on during the acting part of the stroke only. They are operated by dogs moved by the crosshead of the press.



Piston valves 1536 (2 inch common pipe) and 1373 A ($2\frac{1}{2}$ inch common pipe) are used to control the speed and direction of motion of hydraulic elevators. They are controlled by the rope from the car and are designed so that they are suspended from a beam. They are about 28 inches long, 9 inches high and 10 inches wide.



Arbor lifting and reversing device No. 92, for use on a push and pull bench, takes the tube and arbor after it has been pushed through the die on to a cradle, raises them 5 feet 8 inches, and after they are turned by hand, lowers them in readiness for redrawing by pulling them back through a second die. Ram, 6 inches diameter; working pressure, 100 pounds per square inch; controlling valves included, weight 580 pounds. Price, \$.....

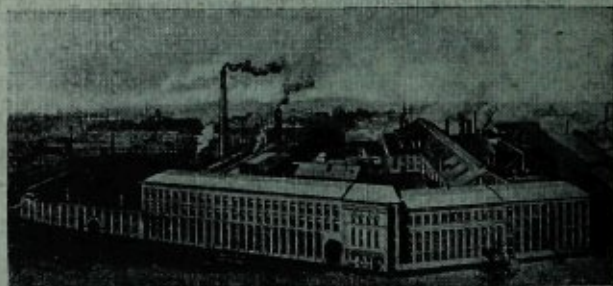


Photo 1053 shows dies No. 1699 for blanking brass 11 6-10 inches diameter and 8-10 inch thick used with 750 ton hydraulic press No. 2116 (page 6 H).

Weight, 1340 pounds. Price, \$.....

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