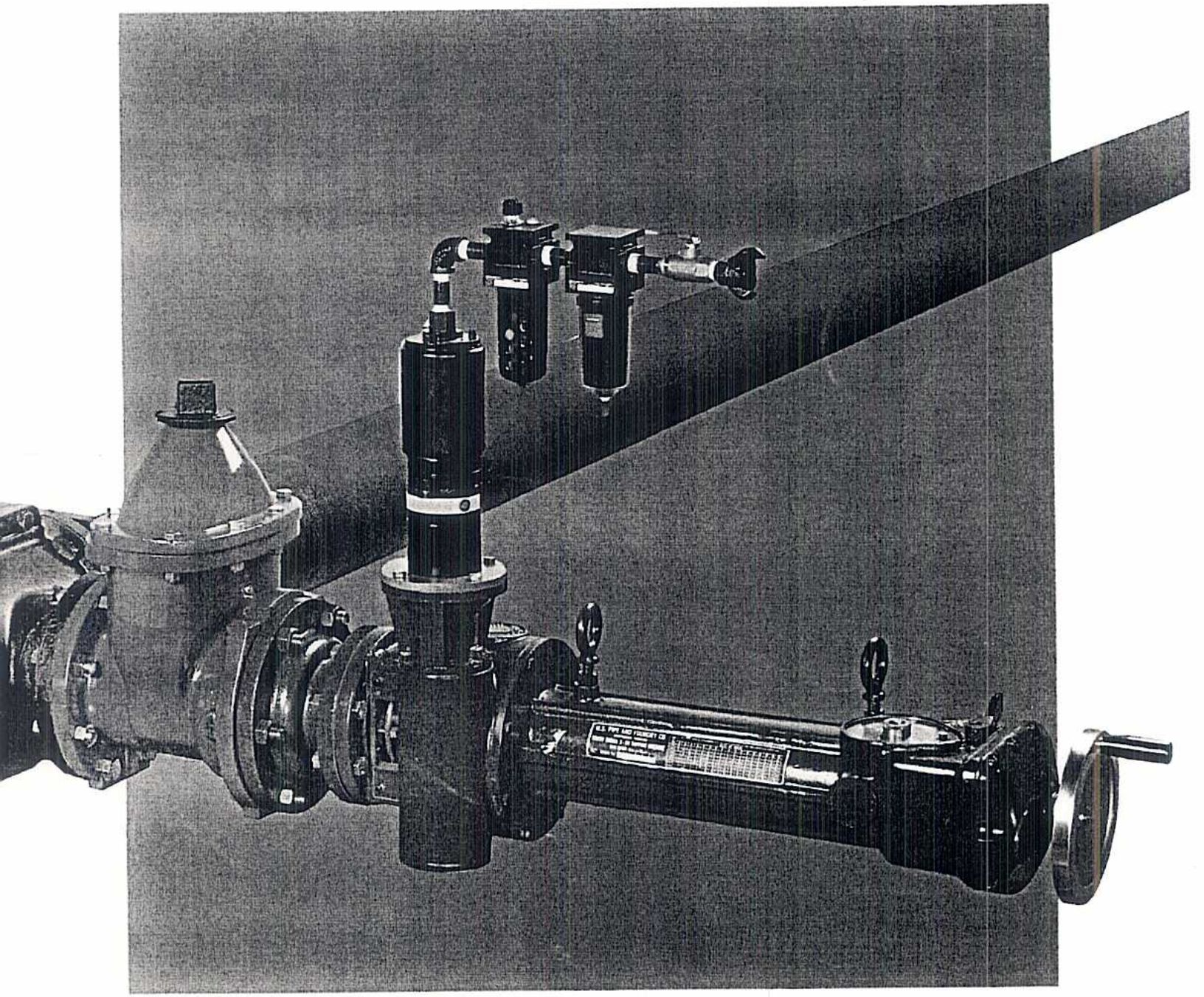
U.S. PIPE—SMITH MODEL S-54

1995 EDITION

TAPPING MACHINES

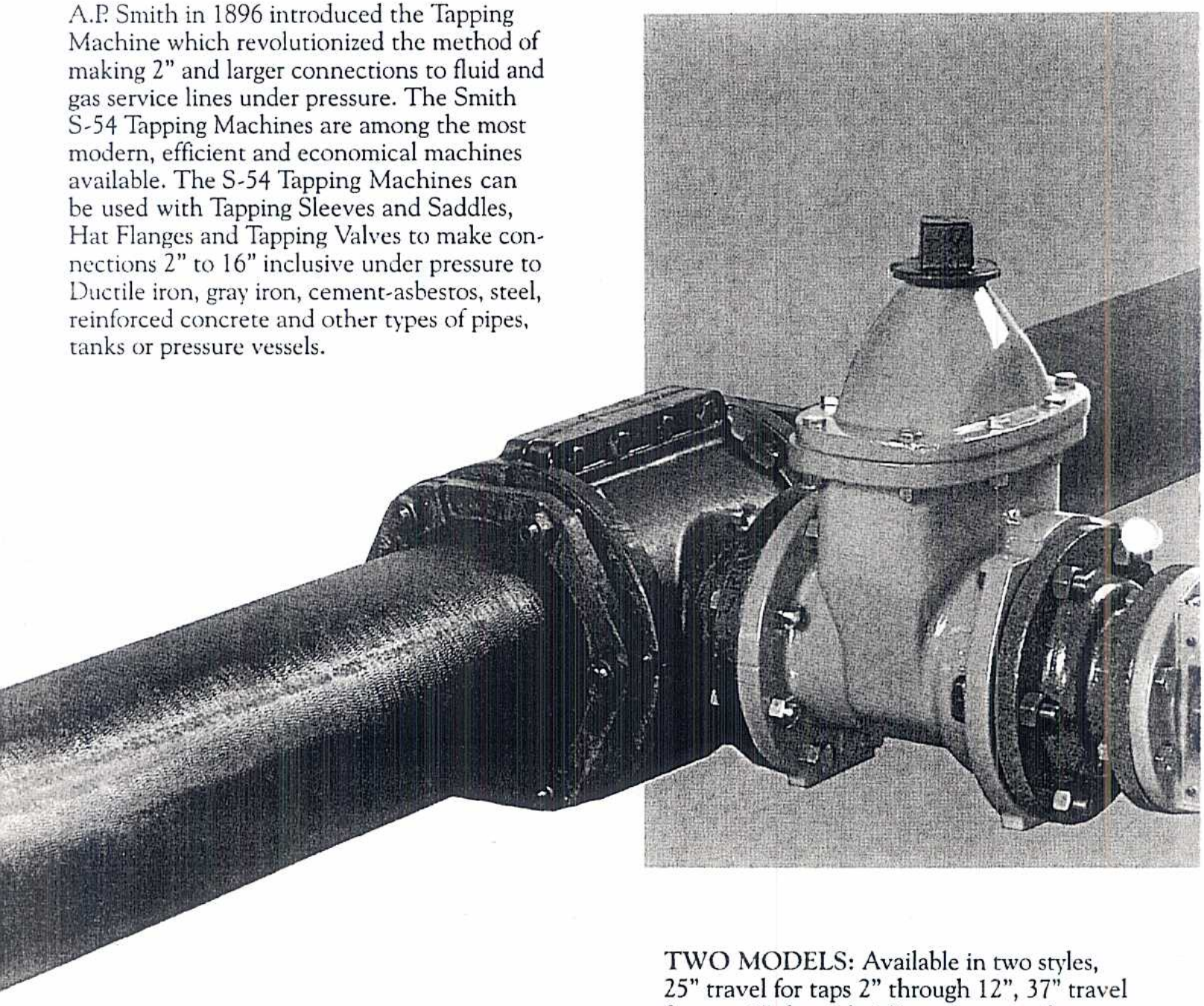
For Pressure Connections 2"-16" Diameter



U.S. PIPE

TAPPING OPERATIONS 2" to 16"

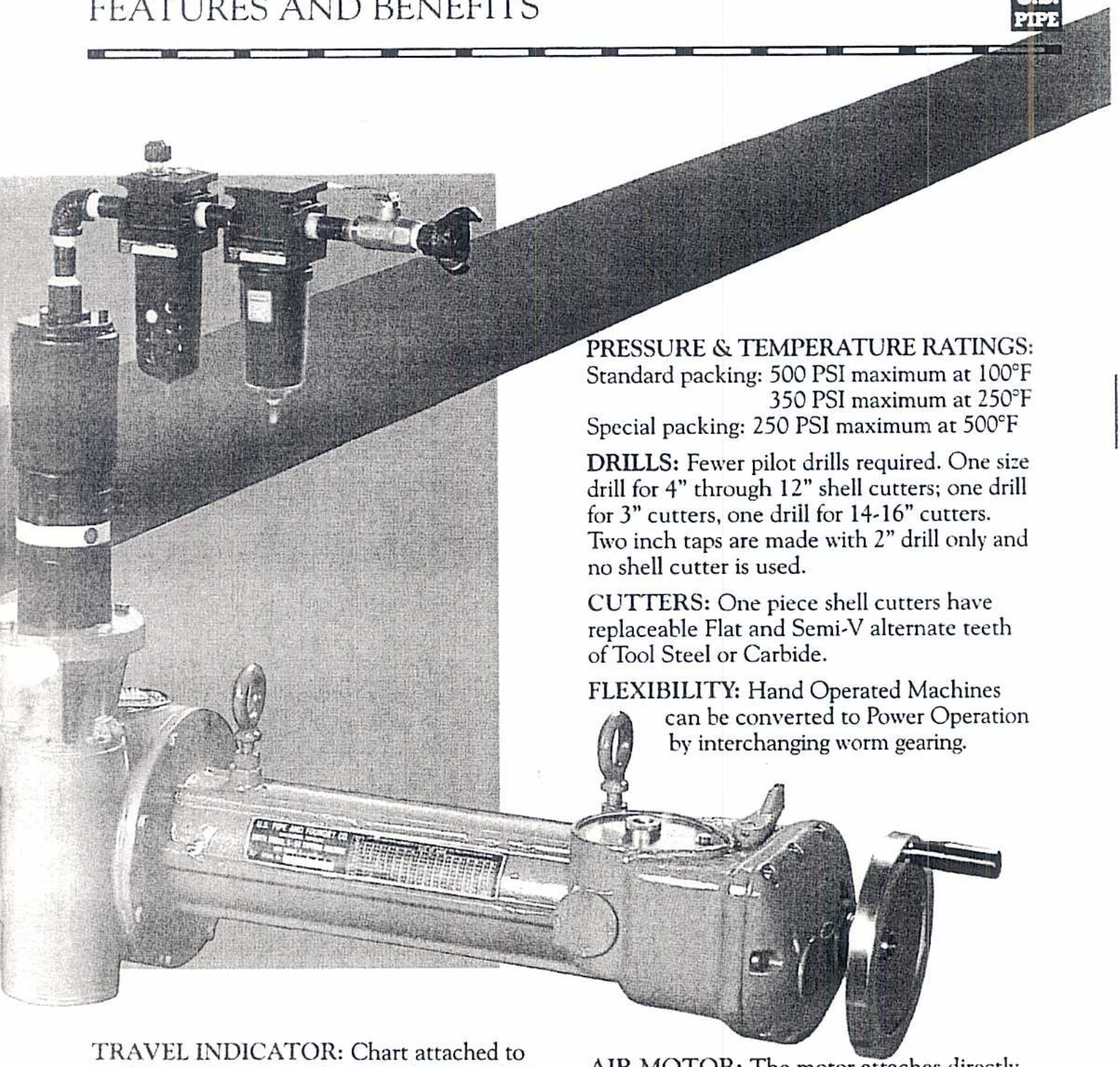
A.P. Smith in 1896 introduced the Tapping Machine which revolutionized the method of making 2" and larger connections to fluid and gas service lines under pressure. The Smith S-54 Tapping Machines are among the most modern, efficient and economical machines available. The S-54 Tapping Machines can be used with Tapping Sleeves and Saddles, Hat Flanges and Tapping Valves to make connections 2" to 16" inclusive under pressure to Ductile iron, gray iron, cement-asbestos, steel, reinforced concrete and other types of pipes, tanks or pressure vessels.



TWO MODELS: Available in two styles, 25" travel for taps 2" through 12", 37" travel for taps 2" through 16" on any size of pipe.

AUTOMATIC FEED: Positive automatic feed insures correct drilling and tapping rate. Hand feed is provided to rapidly advance and withdraw Cutter.

FEATURES AND BENEFITS



PRESSURE & TEMPERATURE RATINGS:
Standard packing: 500 PSI maximum at 100°F
350 PSI maximum at 250°F
Special packing: 250 PSI maximum at 500°F

DRILLS: Fewer pilot drills required. One size drill for 4" through 12" shell cutters; one drill for 3" cutters, one drill for 14-16" cutters. Two inch taps are made with 2" drill only and no shell cutter is used.

CUTTERS: One piece shell cutters have replaceable Flat and Semi-V alternate teeth of Tool Steel or Carbide.

FLEXIBILITY: Hand Operated Machines can be converted to Power Operation by interchanging worm gearing.

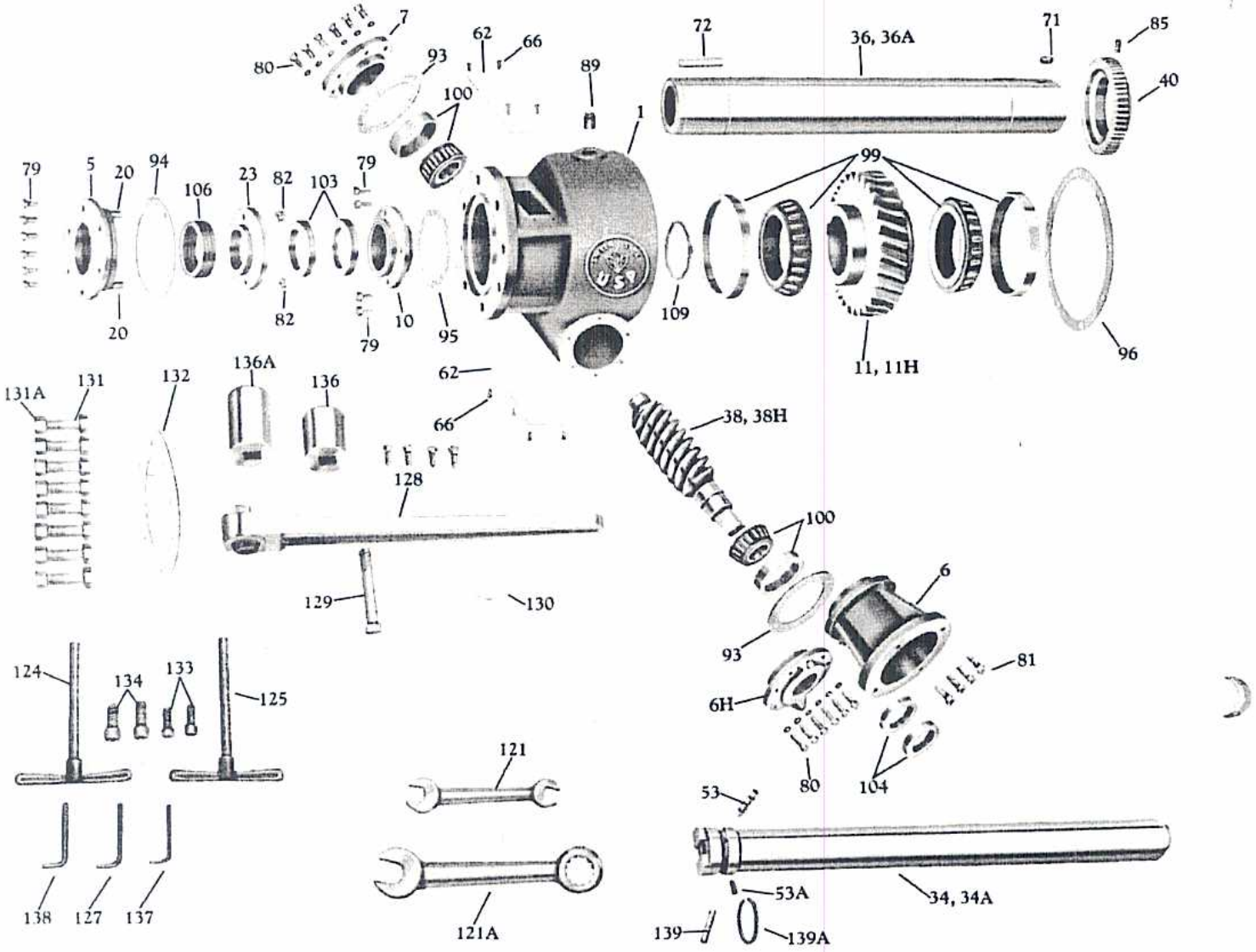
TRAVEL INDICATOR: Chart attached to machine indicates travel required to complete tap. Travel is AUTOMATICALLY terminated when tap is completed. Cutter and shaft cannot over-travel.

STUFFING BOX AND PACKING GLAND: Accessible without disassembling machine. Equipped with Chevron packing. Line pressure cannot enter machine case.

AIR MOTOR: The motor attaches directly to the Power Operated Machine without a Bracket, Holder or Adapter.

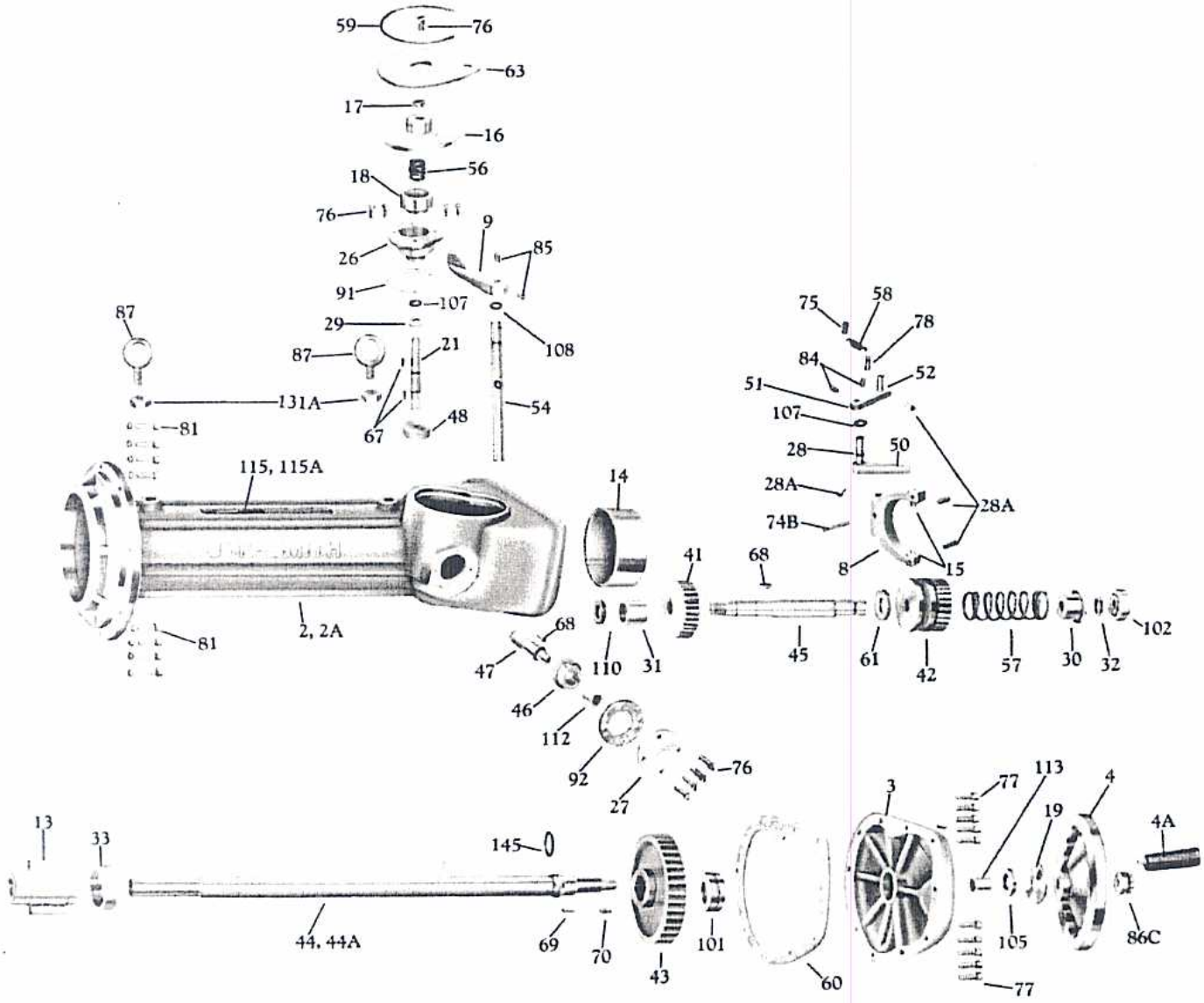
HYDRAULIC MOTOR OPTION: Available for 25" and 37" travel machines. Available with either motor only or motor with power unit.

BILL OF MATERIAL FOR S-54 & S-54H SMITH TAPPING MACHINES



S-54 & S-54H TAPPING MACHINE PARTS for machines built since 1992

CAT NO.	PART NO	NO REQ ASSY	DESCRIPTION	CAT NO	PART NO.	NO REQ ASSY	DESCRIPTION	CAT NO.	PART NO	NO REQ ASSY	DESCRIPTION
1	301011	1	LOWER HOUSING	21	301005	1	INDICATOR SHAFT	45	301064	1	CLUTCH SHAFT
2	301031	1	25" UPPER HOUSING	23	301006	1	STUFFING BOX GLAND	46	301065	1	1ST RED. INDICATOR GEAR
2A	301781	1	37" UPPER HOUSING	26	301007	1	BEARING CAP	47	301066	1	2ND RED. IND. WORM & SHAFT
3	301041	1	HOUSING COVER	27	301024	1	BUSHING CAP	48	301067	1	2ND RED. INDICATOR GEAR
4	301069	1	HANDWHEEL S-54 NEW	28	301025	1	LEVER SHAFT	50	301074	1	LEVER TRIGGER
4A	301068	1	HANDLE FOR HANDWHEEL	28A	010545	4	1/8 X 1/2 LG SPRING PIN	51	301075	1	DIAL LEVER
5	301051	1	STUFFING BOX CAP	29	301026	1	SPACER	52	301076	1	DIAL LEVER CAM PIN
6	301081	1	MOTOR SUPPORT CAP	30	301027	1	SPRING GUIDE	53	301077	1	DRILL RETAINING PIN GROOVED-OLD STYLE
6H	301751	1	WORM SHAFT THRU CAP, HAND	31	301034	1	CLUTCH SHAFT WASHER	53A	009131	1	1/4 - 20 X 1/4 DOG POINT SET SCREW
7	301101	1	WORM SHAFT BLIND CAP	32	301033	1	E-RETAINER RING	54	301084	1	SHIFTER SHAFT
8	301111	1	CLUTCH FORK	33	301036	1	CUTTER SLEEVE NUT	56	301085	1	DIAL SPRING
9	301121	1	DECLUTCH HANDLE	34	301044	1	25" CUTTER ARM JAW & SHAFT	57	301086	1	CLUTCH SPRING
10	301141	1	OIL SEAL RETAINER	34A	301407	1	37" CUTTER ARM JAW & SHAFT	58	301087	1	TRIGGER SPRING
11	301151	1	WORM GEAR RIM, MOTOR OPERATED	36	301045	1	25" WORM GEAR SLEEVE	59	301094	1	WINDOW RETAINER SPRING
11H	301761	1	WORM GEAR RIM, HAND OPERATED	36A	301414	1	37" WORM GEAR SLEEVE	60	301095	1	HOUSING COVER GASKET
13	301171	1	ACTUATOR NUT	38	301046	1	WORM AND SHAFT, MOTOR OPERATED	61	301096	1	BUMPER WASHER
14	301181	1	SLEEVE BUSHING	38H	301405	1	WORM AND SHAFT, HAND OPERATED	62	301097	2	LUCITE WINDOW, LOWER HOUSING
15	301014	2	FORK PIN	40	301047	1	SPUR GEAR	63	301104	1	LUCITE WINDOW, DIAL
16	301811	1	DIAL & CAM	41	301054	1	SPUR PINION	66	009081	8	10 - 24 X 3/8 SOCKET HD CAP SCREW
17	301015	1	DIAL RETAINER	42	301055	1	SPUR (CLUTCH) PINION	67	011702	2	1/8 SQ X 3/8 RD END KEY
18	301016	1	INTERNAL GEAR	43	301056	1	SPUR GEAR	68	011704	2	3/16 SQ X 3/8 KEY
19	301017	1	HANDWHEEL COLLAR	44	301057	1	25" SCREW SHAFT	69	011712	1	1/4 SQ X 1" LG KEY
20	301004	2	STUD, STUFFING BOX CAP	44A	301415	1	37" SCREW SHAFT	70	011707	1	3/16 SQ X 7/8 LG KEY



(cont.)

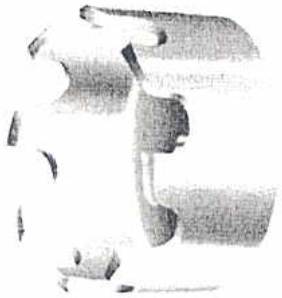
CAT NO	PART NO.	NO REQ ASSY	DESCRIPTION
71	011735	1	⅛ X ⅛ X ¼ KEY
72	011737	1	⅜ X ⅜ X 3 KEY
74B	010518	1	SPRING PIN ⅜ X 1
75	009130	1	10NF X ¼ CP SL SET SCREW
76	008591	9	10 - 32 X ½ FHD MACHINE SCREW
77	008362	10	¼ - 18 X ⅝ SOCHD CAP SCREW
78	010531	1	⅛ X ⅝ T6 GROOVE PIN
79	008361	10	¼ X ⅝ SOCHD CAP SCREW
80	008291	12	⅜ X ⅝ HXHD CAP SCREW
81	007930	12	⅜ X 1 HXHD CAP SCREW
82	007001	2	⅜ - 16 NC2 REG. HEX NUT
84	009060	2	10 - 32 X ¼ SOCKET HD SET SCREW
85	008860	3	¼ - 20 X ⅜ DOG PT. SET SCREW
86C	011365	1	ELASTIC STOP NUT
87	002420	2	⅜ EYE BOLT
89	007820	2	¾ SOLID PIPE PLUG
	301124	1	IND. SHAFT BRG. CAP GASKET
	301125	1	RED. GEAR BUSHING CAP GASKET
	301126	2	WORM SHAFT CAP GASKET
	301127	1	STUFFING BOX CAP GASKET
95	301134	1	LOWER HOUSING SEAL RET. GASKET
96	301135	1	UPPER HOUSING GASKET ½
99	010901	2	ROLLER BEARING

CAT NO	PART NO.	NO REQ ASSY	DESCRIPTION
100	010902	2	ROLLER BEARING
101	010904	1	BALL BEARING (THRUST)
102	010903	1	BALL BEARING (RADIAL)
103	011002	2	OIL SEAL
104	011003	2	OIL SEAL
105	011001	1	OIL SEAL
106	301137	1	CHEVRON PACKING SET
107	010011	2	"O" RING
108	010012	1	"O" RING
109	011303	1	SNAP RING
110	010704	1	BUNTING BUSHING
112	010702	1	BUNTING BUSHING
113	010703	1	BUNTING BUSHING
115	301144	1	25" TRAVEL CHART 2-12"
115A	301145	1	37" TRAVEL CHART 14-16"
121	011101	1	DOUBLE END WRENCH ½ X ¼
121A	011123	1	¾ COMBINATION WRENCH
124	011107	1	"T" ⅜ HEX WRENCH KEY
125	011108	1	"T" ¼ HEX WRENCH KEY
127	011106	1	⅛ ALLEN WRENCH
128	011114	1	LOWELL 53 RATCHET WRENCH
129	001827	1	½ NC2 X 5" LG HXHD BOLT
130	007401	1	½ FLAT WASHER

CAT NO	PART NO.	NO REQ ASSY	DESCRIPTION
131	001861	8	⅜ NC2 X 2¼ HXHD BOLT
131A	007040	10	⅜ - 11 NC2 REG. HEX NUT
132	301146	1	MACHINE ADAPTER GASKET
133	008364	2	⅜ X 1¼ SCHD. CAP SCREW
134	008365	2	⅜ X 1½ SCHD. CAP SCREW
136	301191	1	MOTOR SOCKET OLD MOTOR
			2¾ LG X 1¼ SQ BOTH ENDS
136A	301200	1	MOTOR SOCKET NEW MOTOR
			3¾ LG X 1¼ X ⅝ SQ ENDS
137	011127	1	⅝ ALLEN WRENCH
138	011105	1	¾ ALLEN WRENCH
139	301078	1	RETAINER PIN-SOLID
139A	301353	1	SPRING DRILL RETAINER NEW
140	301491	1	ADAPTER PLATE - NEW AIR MOTOR
141	302218	1	LUBRICATION DECAL
142	011282	1	LUBRICATOR UNIT - AIR MOTOR
143	011281	1	AIR FILTER UNIT - AIR MOTOR
144	300798	1	AIR MOTOR COMPLETED/AIR FILTER & LUBRICATOR
145	10009	1	"O" RING
-	WOODEN SHIPPING/STORAGE CHEST		

H SIGNIFIES HAND OPERATED MACHINE
ALL DIMENSIONS IN INCHES

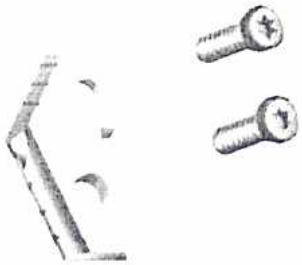
ACCESSORIES FOR S-54 U.S. PIPE SMITH TAPPING MACHINES



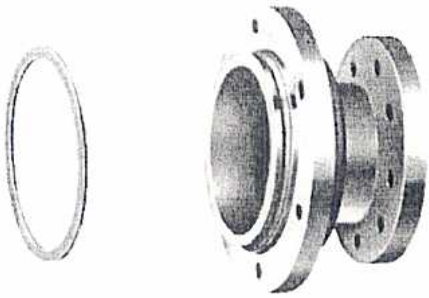
Shell Cutter 3"-16"

#162 tool steel #163 carbide tipped for 3"-12" specify full size or 1/2" undersize

Pilot drill with replaceable tip and latch. 4"-12" size



Field replaceable spade-type drill tip



Mechanical Joint Adapter

SHELL CUTTERS

Shell Cutters are used to make taps 3"-16" and are available either carbide tipped or tool steel tipped. Carbide tip shell cutters are used for cement lined iron or steel pipe, concrete pipe or asbestos cement pipe. Carbide Tips will stay sharp longer when cutting abrasive materials. Tool steel cutters may be used on iron or steel pipe, not cement lined. Tips are flat and semi-V shape placed alternately on the cutter. They are attached to the cutter by brazing and are replaceable. 3"-12" shell cutters can be ordered full size or 1/2" undersize. Special "Indexible" shell cutters are also available in place of the regular shell cutters shown. Contact factory sales office (615-752-3700) for detailed information.

PILOT DRILLS

Only three sizes of pilot drills are needed: 4"-12" shell cutters use the same pilot drill. This drill has two retainer pin holes. One hole setting is for use with 4", 6" & 8" cutters. The other pin hole is for 10" & 12" cutters. Each pin hole is marked for the cutter size range. Separate pilot drills are used for 3" shell cutters and 14"-16" cutters. These two size ranges each have a single pin hole.

Coupon retention: 4"-12" and 14"-16" pilot drills are provided with an integral latch assembly for positive coupon retention. This is especially valuable when tapping pipe above the horizontal center line. Latch assemblies are field replaceable.

Replaceable drill tips: All pilot drills and 2" drill utilize a spade-type field replaceable drill tip of either carbide or tool steel. The tips are secured with special torx head screws. A torx head driver is supplied with drills and replacement tip kits. The drill tips can be resharpened locally as required.

TWO INCH DRILLS

Two inch holes are made with a 2" drill as this size is too small for a shell cutter.

ADAPTERS

Adapters are required to connect the tapping machine to the various joints and sizes of tapping valves. Mechanical Joint Adapters #166 are furnished with "O" ring gasket #169. Flanged Adapters #167 fit AMSE/ANSI B16.1 Class 125 flanges or B16.5 Class 150 flanges. They are furnished with gasket #170 and bolts and nuts #174. Push-on (TYTON® Fitting) adapters #176 are furnished with gasket #168 and bolts and nuts #171. Adapters are available in sizes 2"-16", indicate part number and size.

STANDARD EQUIPMENT FURNISHED WITH EACH MACHINE (see parts list):

- ▶ Ratchet wrench with attachment bolt and washer
- ▶ Two double end wrenches
- ▶ Two tee handle Allen key wrenches
- ▶ Three standard Allen key wrenches
- ▶ Machine to adapter bolts, nuts and gasket
- ▶ Machine with above equipment is shipped in a substantial wooden chest.

EQUIPMENT TO BE SELECTED

- ▶ Adapters
- ▶ Shell cutters
- ▶ Pilot drills
- ▶ Air or hydraulic motor

OPERATING INSTRUCTIONS

Test the valve and tapping sleeve/saddle assembly mounted on the pipe before connecting the tapping machine to the valve. Test the tapping sleeve and valve assembly by removing the test plug in the tapping sleeve and attach a pressure line from a convenient source or from a portable test pump. Test with water only and do not exceed the working pressure of the valve. After completing the test, replace the test plug, using pipe dope or tape.

1. Examine the shell cutter tips and pilot drill point to be sure they are sharp and in satisfactory condition, i.e., that they are not rounded off (indicating dullness), chipped or broken.

2. Examine adapter and gasket for damage. Bolt proper size adapter to machine.

3. If automatic feed is engaged, release the automatic feed by moving the dial lever cam pin (part #52), which protrudes through the transparent cover plate of the dial indicator (part #63), toward the handwheel. This allows you to advance or retract the boring bar by turning the handwheel.

4. Advance the boring bar by rotating the handwheel to the LEFT (counter-clockwise) until the drill pin hole projects beyond the adapter and is accessible.

5. Insert the pilot drill into the shell cutter and place it onto the boring bar with the Allen screws slightly loose (two Allen head cap screws and a tee handle Allen key wrench are provided). Push the pilot drill into the boring bar and align the correct hole (each drill is marked indicating cutter size or sizes with which it should be used). Insert retaining pin (#139) and lock it in place with snap ring (part #139A); rotate the snap ring so that the open end of the ring is at a right angle to the retaining pin. Tighten the Allen screws to hold the shell cutter. Retract the cutter into the adapter by turning the handwheel to the RIGHT (clockwise). Care should be taken not to jam the cutter back into the adapter.

6. Completely open the tapping valve. Some types of valves may not be suitable for tapping because insufficient distance between the gate and valve face will cause the gate to hang up on the pilot drill and the valve cannot be closed. To verify, with the adapter mounted on the tapping machine and the shell cutter and pilot drill fully retracted, measure the distance from the face of the adapter flange to the tip of the pilot drill. This distance must be less than the distance from the gate of the closed valve to the face of the valve outlet which connects to the adapter flange.

7. Examine and position tapping valve gasket. Attach adapter/machine assembly to the tapping valve. Tapping machine travel indicator should face upwards for convenient reading. Support the assembly by blocking under the tapping valve and the middle of the tapping machine. Do not allow the machine assembly to hang unsupported from the tapping valves.

8. Advance boring bar by rotating handwheel to the left (counterclockwise) until the point of the pilot drill just touches the pipe. Care must be used to insure the drill does not forcibly strike the pipe which will damage the drill point.

9. Retract boring bar by turning the handwheel one full revolution clockwise. This will permit the pilot drill to center itself into the pipe after the machine starts. Depress the brass dial and cam (part #16) and rotate the dial to the corresponding inch setting as found on the travel chart on the machine case. Be sure the dial pops up from its depressed position at the correct setting before starting the machine. **IF THIS IS NOT DONE THE MACHINE WILL NOT DISENGAGE AT THE COMPLETION OF THE TRAVEL DISTANCE SET, AND THE CUTTER CAN CONTINUE TO RUN INTO THE OPPOSITE SIDE OF THE PIPE.**

10. The air motor spindle couples directly to the square of the machine drive shaft via a motor socket (part #136). Attach air motor. Be sure air filter and lubricator are attached to the air motor. The lubricator is filled with oil and should be checked before each use. Use 10-W-30 motor oil when required.

> CAUTION: Whenever the machine is operating under either power from the motor or manual operation by the ratchet, the handwheel will turn in the clockwise direction. The only time the handwheel may be allowed to turn in the counterclockwise direction is when it is turned by hand after releasing the automatic feed, see paragraph 3. Never operate the machine under power in reverse or in such a way to cause the handwheel to turn counterclockwise as serious damage will result.

11. Turn the air motor ball valve fully open and push the declutch handle (part #9) forward until it catches. The automatic feed position is marked with raised cast letters on the machine case. A gage pressure to the motor of 90 PSI @ 90 CFM is required. Continue the operation until the tap is completed. The automatic feed will disengage at the preset travel chosen, and the dial (part #16) will be at zero when the tap is completed. The S-54 tapping machines have been carefully designed to employ an automatic feed which insures the correct cutting rate under normal conditions. The automatic feed should therefore always be used unless difficulty is encountered which is usually caused by extremely hard pipe, or cutters and drills which are dull or have been damaged. In this case it will be necessary to remove the machine and correct the problem. Call U.S. Pipe Tapping Department (615) 752-3835 for help. When cutting steel, U.S. Pipe recommends hand feeding and the use of a tool steel pilot drill and cutter instead of carbide tipped. Hand feeding is done as follows: first disengage automatic feed. (This may be done whether air motor is running or not.) Automatic feed is disengaged by moving the dial lever cam pin back toward the handwheel (see instruction #3). With the motor running, the handwheel will turn clockwise. However, since the feed is disengaged, the cutter is rotating but not moving forward. By slightly retarding the handwheel rotation by gently touching the handwheel every turn or every other turn, you are feeding the cutter at a much slower rate than it would advance if it were under automatic feed. Be sure not to hold the handwheel in one position. This will cause an excessive feed rate which will jam the cutter into the wall of the pipe and cause serious damage. Since hand feeding requires that the automatic feed be disengaged, the machine will not stop automatically after the cut is complete. Therefore, the operator should understand this and realize that when hand feeding, the cut is complete when no more resistance is felt when attempting to retard the rotation of the handwheel and when no more cutting sound is heard. At this point, shut off the motor and verify completion of the tap as described in step 13.

12. If, for any reason air power is lost during the operation of the tapping machine, do the following: A. If there is a drop in pressure and pressure loss is imminent, try to disengage automatic feed by pushing dial lever cam pin (part #52) toward the handwheel. This stops the cutting action of the machine. Do not change the travel distance remaining on the dial. B. Before resuming operation, retract the shell cutter by rotating handwheel clockwise one revolution. This will prevent damage to cutter teeth which must not be in contact with the pipe when the machine starts.

13. Assuming that the machine has been running on automatic feed, continue operation until cutter stops cutting. The automatic feed will disengage at the preset travel required to complete the tap. The travel indicator will be at zero when the tap is completed.

14. Before removing air motor or ratchet check completion of tap by attempting to advance cutter by rotating handwheel to the LEFT (counter-clockwise) one turn. If cutter does not advance freely without operating motor or ratchet, reset travel indicator for 1/2" travel and reengage automatic feed. Remember to back off shell cutter one turn before resuming cut. Continue machine operation until tap is completed and automatic feed has been released. Discontinue air supply.

15. Withdraw boring bar and cutter to rearmost position by rotating handwheel to the RIGHT (clockwise) until the handwheel stops. The handwheel should stop lightly with no pressure exerted on it.

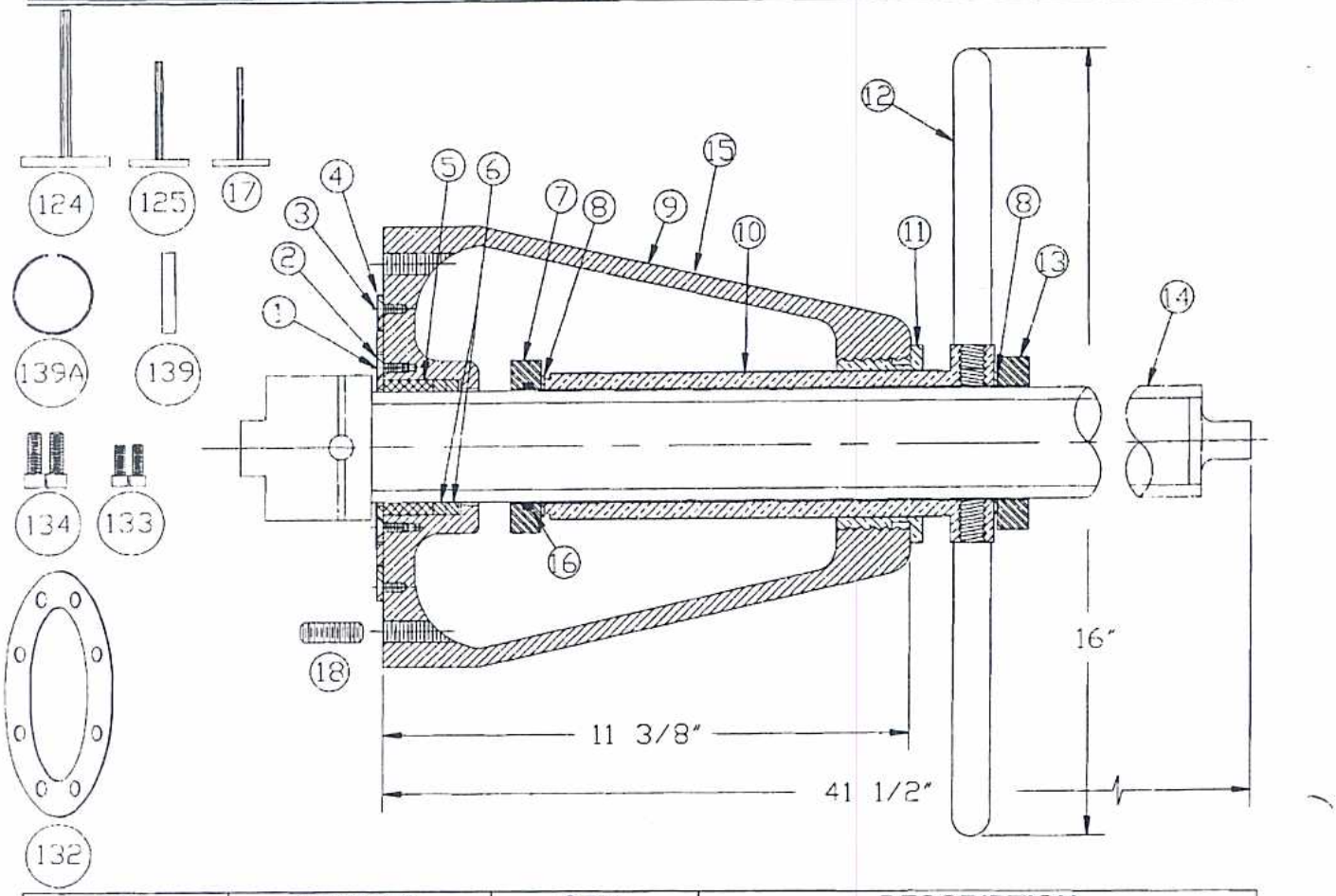
16. Close tapping valve.

17. Unbolt adapter/machine assembly from valve.

18. Advance boring pin bar by rotating handwheel to the LEFT (counter-clockwise) until the cutter projects beyond the adapter and the drill retaining pin is accessible. Remove the retaining pin, pilot drill and the pipe coupon from the cutter. Care should be used to avoid damage to cutter teeth while the coupon is being removed. Remove cutter and adapter, and retract boring bar by rotating handwheel slowly to the right (clockwise) until the handwheel stops. The handwheel should stop lightly with no pressure exerted on it.

19. Machine and accessories should be thoroughly cleaned. Drills and cutters should be oiled or greased for protection while not in use. **PACKING:** The machine stuffing box (part #23) is equipped with Chevron packing which requires a minimum of adjustment. You can adjust the flow of water past the packing and the tension of the travel advance of the shaft by removing the clear plastic windows (part #62) and adjusting the stuffing box gland with the two nuts (parts #82) on each side of the stuffing box. If the gland is adjusted too tightly, the handwheel will be hard to operate. Water passing the packing drains out through a drain hole in the lower housing. Special packing is available for high temperature service. **LUBRICANT:** Machine parts are housed in an aluminum case filled with oil. The oil should be changed every 6-8 months. To change the oil remove the 1/2" pipe plugs; one located in part #1, and one is part #2. Rotate machine on its side to allow the oil to fully drain. To refill, extend boring bar approximately 16", turn holes upright and pour one quart of the required amount of oil in part #1 and the remaining amount in part #2. The 25" travel machine requires 5 quarts. The 37" travel requires 6 quarts. Use 85W-140 gear oil or equivalent. Retract the shaft then replace the pipe plugs. This order of operation should be followed to eliminate air pressure from building in the machine case and possibly blowing a seal. **SHELL CUTTERS AND PILOT DRILLS:** When cutters or drills with brazed-in teeth become dull or the tips are damaged, they should be returned for reconditioning to United States Pipe and Foundry Co., Valve & Hydrant Products, 2501 Chestnut St., Chattanooga, TN 37408. Customers that have indexable shell cutters and the changeable tip pilot drill can purchase these replaceable tips and screws from U.S. Pipe. The pilot drill tips are available in carbide and tool steel. The indexable cutter is carbide only. Both can be changed by the customer.

BILL OF MATERIAL FOR S-94 TAPPING MACHINE



NO.	PART NO.	QTY.	DESCRIPTION
1	009040	4	FL.HD.MACHINE SCREW
2	300641	1	SEAL RETAINER
3	009040	4	FL.HD. MACHINE SCREW
4	300651	1	ADAPTER RING
5	010716	1	SHAFT BEARING
6	011029	2	SHAFT SEALS
7	011286	1	CLAMP COLLAR/BREAK
8	300232	2	FRICTION WASHER
9	300811	1	FRAME
10	300831	1	FEED SCREW
11	300821	1	FEED SCREW BUSHING
12	300026	4	FEED SCREW HANDLES
13	011285	1	CLAMP COLLAR
14	300239	1	CUTTER SHAFT
15	301144	1	TRAVEL CHART
16	010013	1	"O" RING, SPLIT
17	011120	1	1/4" HEX WRENCH
18	006725	8	5/8"X2 1/2" STUD
124	011107	1	3/8" HEX WRENCH
125	011108	1	5/16" HEX WRENCH
132	301146	1	MACHINE ADAPT. GSKT.
133	008364	2	3/8"X1 1/4" SCHD CAP. SCR.
134	008365	2	1/2"X1 1/2" SCHD CAP. SCR.
139	301078	1	RETAINER PIN - SOLID
139A	301353	1	DRILL PIN RET. SPRING

Shell Cutter 3"-12"

#162 tool steel #163 carbide tipped
For 3"-12" specify full size or 1/2" undersize

SHELL CUTTERS

Shell cutters are used to make taps 3"-12" and are available either carbide tipped or tool steel tipped. Carbide tip shell cutters are used for cement lined iron or steel pipe, concrete pipe or asbestos cement pipe. Carbide tips will stay sharp longer when cutting abrasive materials. Tool steel cutters may be used on iron or steel pipe, not cement lined. Tips are flat and semi-V shape placed alternately on the cutter. They are attached to the cutter by brazing and are replaceable. 3"-12" shell cutters can be ordered full size or 1/2" undersize. Special "Indexible" shell cutters are also available in place of the regular shell cutters shown. Contact factory sales office (615-752-3700) for detailed information.

Pilot drill with replaceable tip and latch. 4"-12" size

PILOT DRILLS

Only two sizes of pilot drills are needed: 4"-12" shell cutters use the same pilot drill. This drill has two retainer pin holes. One hole setting is for use with 4", 6" & 8" cutters. The other pin hole is for 10" & 12" cutters. Each pin hole is marked for the cutter size range. Separate pilot drills are used for 3" shell cutters. This size has a single pin hole.

Coupon retention: The 4"-12" pilot drill is provided with an integral latch assembly for positive coupon retention. This is especially valuable when tapping pipe above the horizontal center line. Latch assemblies are field replaceable.

Replaceable drill tips: All pilot drills and the 2" drill utilize a spade-type field replaceable drill tip of either carbide or tool steel. The tips are secured with special torx head screws. A torx head driver is supplied with drills and replacement tip kits. The drill tips can be resharpened locally as required.

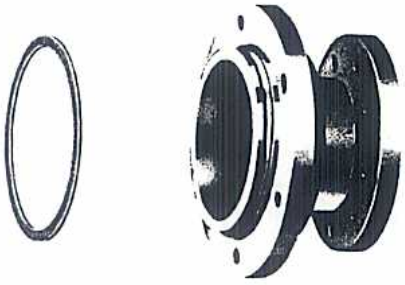
Field replaceable spade-type drill tip

TWO INCH DRILLS

Two inch holes are made with a 2" drill as this size is too small for a shell cutter.

ADAPTERS

Adapters are required to connect the tapping machine to the various joints and sizes of tapping valves. Mechanical Joint Adapters #166 are furnished with "O" ring gasket #169. Flanged Adapters #167 fit ANSI/AWWA C110/A21.10 flanges or ASME B16.1 Class 125 flanges. They are furnished with gasket #170 and bolts and nuts #174. Push-on (TYTON® Fittings) adapters # 176 are furnished with gasket # 168 and bolts and nuts #171. Adapters are available in sizes 2"-12"; indicate part number and size.



Mechanical Joint Adapter

STANDARD EQUIPMENT FURNISHED WITH EACH MACHINE (see parts list):

- Two double end wrenches
- Three tee handle Allen key wrenches
- Machine to adapter bolts, nuts and gasket
- Machine with above equipment is shipped in a substantial wooden chest.

EQUIPMENT TO BE SELECTED

- Adapters
- Shell cutters
- Pilot drills
- Air or electric operators

Test the valve and tapping sleeve/saddle assembly mounted on the pipe before connecting the tapping machine to the valve. Test the tapping sleeve and valve assembly by removing the test plug in the tapping sleeve and attaching a pressure line from a convenient source or from a portable test pump. Test with water only and do not exceed the working pressure of the valve. After completing the test, replace the test plug, applying pipe dope or Teflon thread sealant.

1. Examine the shell cutter tips and pilot drill to be sure they are sharp and in satisfactory condition, i.e., that they are not rounded off (indicating dullness), chipped or broken.

2. Examine adapter and gasket for damage. Bolt proper size adapter to the machine.

3. Loosen the clamping collars, front (#7) and rear (#13). Push the cutter shaft (#14) forward until the drill pinhole projects beyond the adapter and is accessible.

4. Insert the pilot drill into the shell cutter and place it onto the boring bar, with Allen screws slightly loose (two Allen head cap screws and a tee handle wrench are provided). Push the pilot drill into the boring bar and align the correct hole (each drill is marked indicating cutter size or sizes with which it should be used). Insert retaining pin (#139) and lock it in place with retainer spring (#139A); rotate the retainer spring so that the open end of the ring is at a right angle to the retaining pin. Tighten the Allen screws to hold the shell cutter. Pull the shaft rearward to bring the cutter into contact with the adapter. Snug the rear collar (#13) to prevent the shaft and cutter from sliding forward during the assembly process.

NOTE: FOR S-94 MACHINES EQUIPPED WITH A CL-12 STYLE SHAFT, REMOVE THE ADAPTER RING (#4). MOUNT THE CUTTING EQUIPMENT AS YOU WOULD FOR A MUELLER CL-12 MACHINE.

5. Completely open the tapping valve. Some types of valves may not be suitable for tapping because of insufficient distance between the gate and valve face. This will cause the gate to hit the pilot drill and the valve cannot be closed. To verify that the valve has sufficient clearance, measure the distance from the face of the adapter flange to the tip of the pilot drill with the adapter mounted on the tapping machine and the shell cutter and pilot drill fully retracted. This distance must be less than the distance from the gate of the closed valve to the face of the valve outlet which connects to the adapter flange.

6. Examine and position the tapping valve gasket. Attach adapter/machine assembly to the tapping valve. Tapping machine travel chart should face upwards for convenient reading. Support the assembly by blocking under the tapping valve.

7. Push the cutter shaft (#14) forward until the pilot drill just touches the pipe. Care must be used to insure the drill does not forcibly strike the pipe which could damage the drill point.

8. Rotate feed screw handles (#12) counterclockwise to back out the feed screw to the desired travel depth which is found on the travel chart (#15), i.e., a 6" tap on a 6" main would require 4 ¾" of travel. Measure the travel distance with a ruler as shown in Figure 1. After travel is set, slide the clamping collars to each side of the feed screw and tighten. Rotate screw handle (#12) one turn counterclockwise to allow the pilot drill to center itself into the water main.

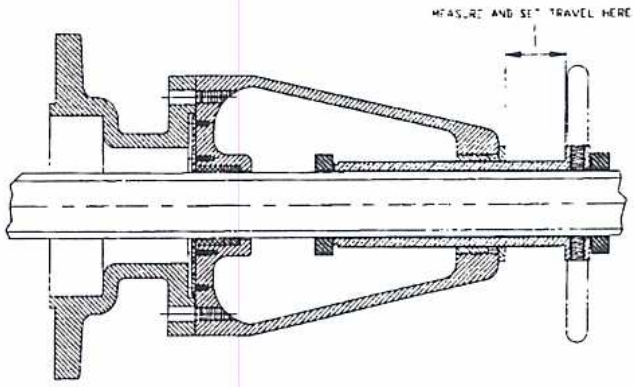


Figure 1

9. Attach the air motor or electric motor to the cutter shaft. The end of the cutter shaft (#16) has a square on the end with a keyway inside. The air motor shaft with key slides in place.

A 3/8" screw holds the shaft secure. **Warning: Operate the motor only in a clockwise rotation. Failure to do so will damage the cutter and pilot drill.** If an electric drive is used, the adapter slides over the square. No key is required.

10. Attached to the air motor is an aluminum handle. An aluminum extension bar bolts to the handle. The extension bar is adjustable so it will rest on the ground (see Figure 2) to prevent the motor from rotating. If the pit is damp, place a 1"x4"x12" long block of wood under the the extension bar and parallel to the centerline on the tapping machine. This will prevent the bar from digging into the soil and lets it slide along with the cutter shaft as the cut is being made.

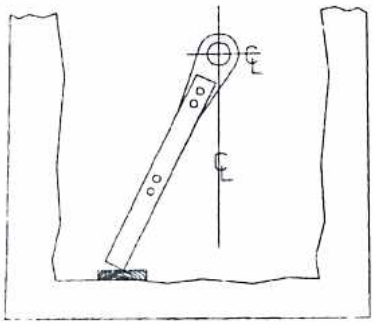


Figure 2

11. Turn the motor on and slowly turn the feed screw handles clockwise (CW). When the cut is in process, if the feed screw is advanced too quickly the motor will bog down and stop which can cause damage to the cutter. If the motor bogs down, rotate the feed screw counterclockwise a 1/4 turn. This action backs the cutter out and allows the motor to regain speed. A steady feed rate is most productive.
Warning: Never stand behind the tapping machine.

12. Continue the cutting operation until no cutting is heard or the feed screw (#10) stops at the feed screw bushing (#11). The tap is complete. Turn off the motor and remove it from the shaft.

13. To retract the cutter shaft, loosen the clamping collar (#13) at the back of the machine. To loosen the front clamping collar (#7) loosen one screw approximately 1/2 turn and loosen the other screw slowly, to allow the cutter shaft to retract slowly and smoothly. The shaft will retract by itself using the water pressure in the line. **Warning: Do not stand behind the cutter shaft at any time.**

14. Retighten the screws on the front clamping collar (#7).

15. The tapping valve can now be closed and the tapping machine adapter assembly unbolted.

16. Extend the cutter shaft until the cutter projects beyond the adapter and the drill retaining pin is accessible. Remove the retaining pin, pilot drill and pipe coupon from the cutter. Care should be used to avoid damage to the cutter teeth while the coupon is being removed. Remove the cutter and adapter and pull the cutter shaft back.

17. The machine and accessories should be thoroughly cleaned. Drill and cutter should be oiled or greased for corrosion protection while not in use. The feed screw should be screwed in completely while not in use to protect the threads.

CAUTION: U.S. Pipe does not recommend the use of electric motors in wet trench conditions. If used, please consult the motor manufacturer's brochure for safety instructions. We assume no responsibility for the use of this option.

Shell cutters and pilot drills: When cutters and drills with brazed-in teeth become dull or the tips are damaged, they should be returned for reconditioning to United States Pipe and Foundry Co., 2501 Chestnut St., Chattanooga, TN 37408. Customers that have indexible shell cutters and the changeable tip pilot drill can purchase these replaceable tips and screws from U.S. Pipe. The pilot drill tips are available in carbide and tool steel. The indexible cutter is available in carbide only. Both can be changed by the customer.